

The Chemical Age

A Weekly Journal Devoted to Industrial & Engineering Chemistry

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NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Other communications relating to advertisements or general matters should be addressed to the Manager.

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World Famine in Motor Spirit

THE point that really matters in the report published this week on the costs, prices, and profits of motor fuels is the sub-committee's conclusion that the production of power alcohol on a world scale offers the only permanent remedy for our present troubles. This quite overshadows all the other features of the report, interesting as they are in detail. It is interesting, for example, if not particularly consoling, to learn that powerful financial interests are taking advantage of the deficiency of motor fuel to raise prices; that an exorbitant profit is being procured by the producer or refiner of petrol at present market prices; that prices should be more rigidly controlled, and so on. Our recent experiences had predisposed us to expect a few observations of this sort, and also to moderate any expectations of relief from Government control. It is quite welcome to learn that some modification of prices

may possibly be brought about by closer regulation, but all these are really matters of detail, and do not substantially touch the root problem of adequate supplies of motor fuel to meet the ever-increasing demand throughout the world.

The Sub-Committee realise this as fully as the rest of us. "We are aware," they state, "that unfortunately these recommendations can only be considered as palliatives to the present alarming situation, and we are convinced that the only solution of the motor fuel problem is the production of home and/or Empire produced power alcohol. We are also of opinion that, unless steps are taken by the Government to control the production of power alcohol, any marked development in the production of power alcohol would, under present circumstances, result in a similar monopoly to that which now obtains in the case of petrol. We think, therefore, that steps should be taken to ensure that the production and distribution of power alcohol shall be under Government control." This, of course, means a State organisation if not for actual production at least for the direction and control of what must become a great world industry, in the organisation of which the chemist and chemical engineer must play a vital part. The experience already gained in munitions work will be of immense value in this new enterprise, and the development of the idea suggested by the Committee will be watched with keen interest. Regarding power alcohol as the "only potentially unlimited source of supply," the Committee urge that the Government should use every possible means to foster the production of power alcohol and to place no restriction on its production and use in this country. This raises a number of interesting issues—whether, for example, private enterprise can be relied on or has sufficient resources to supply the need; whether the Government should itself set up the organisation for power alcohol production, making itself thereby a competitor with private industry; or whether the Government will content itself, as in the case of dyes and other essential industries, with stimulating private enterprise and providing it with necessary subsidies (involving an element of more or less direct control) in the least objectionable form. It is premature to discuss these questions of policy at present, but at the right stage they will have to be faced.

In some points the Committee's outlook extends beyond merely national or even British interests. Motor fuel, it is pointed out, is rapidly becoming of vital importance to practically every industry in all civilised countries. The Committee regard the concentration of the control of motor fuel in the hands of a few great combines as so dangerous a power that the Governments of the world should give attention to it.

"In view of the world-wide operations of these trusts," Mr. McCurdy, M.P., the chairman, remarks, "it does not appear possible for the British Government by itself to deal effectively with this problem. Their possession of the main sources of supply, the chief pipe-lines, the tank steamers, and a considerable part of the distributing arrangements in the various consuming countries, practically prevents the setting up of any private competition which might operate to destroy their monopoly or force them to reduce their prices. Experience in a number of industries during the war has shown the danger of attempting to fix prices without taking effective steps for securing supplies and controlling distribution." The present report is not so great in bulk as some recently issued, but the issues it raises are of world-wide importance, and the industrial developments it points to of quite unusual interest, both chemically and industrially.

The Fine Chemical Trade

WE publish to-day the first of a series of articles dealing in a comprehensive manner with this subject, which in our view, as compared for instance with those of dyes and heavy chemicals, has been discreetly and unjustifiably overlooked, either on account of the apparent hopelessness of finding a remedy or because of the lack of influence of the bulk of the manufacturers concerned. While these articles may not cover the ground in its entirety (nor, in justice to the writer, do we believe he claims that merit for them), we think the progress made since the outbreak of war in the British Fine Chemical Trade is, to put it mildly, sufficiently small to warrant discussion. It must be patent to all connected with the Trade that there is much still to be done before it can hold its own in the competition of the world. The article published to-day cites facts which would be difficult to controvert, and, though some of the statements made may not find general approval, adequate ventilation and publicity are all to the good. The Fine Chemical Trade of Germany was a wonderful and extraordinary achievement. It would be extravagant to claim any such position for the trade of this country as it stands to-day. Further, the writer argues—we think with justice—that there is no *prima facie* evidence that the trade is shaping itself towards the desired end. It may be that forces are at work, though they are not very evident, which will bring forth fruit in their season. If that be so, and we sincerely hope it may be, then perhaps a free discussion in our columns based upon these articles may throw light into the darkness and give encouragement to those who need it. We are all more or less aware of the difficulties, but they are not likely to be eradicated by continued silence.

Manufacturers, merchants, and consumers know that some day the competition of the German concerns must once more make itself felt, and that the competition from the Fine Chemical Trade of other countries, notably America, is already apparent, and will in the future be even more severe. To elaborate this point is unnecessary; but if a basis of co-operation can be devised to bring to the Trade in this country that life and force which seem lacking now in no small degree;

if those in the Trade who can do it will but step into the great national part they might play, then nothing but good can come of a discussion such as we hope may arise from these articles. The writer speaks quite plainly, even bluntly, on some points. We prefer to place his words before our readers as he has chosen to put them. For we are with him at least in this—that we believe the Trade in this country is as capable as that of any other, perhaps more so. We believe the Trade can become a real force in the world's markets. But the time in which that may be accomplished is growing steadily less and less, and if some outspoken suggestions of a constructive character can help to hasten matters, we shall feel glad to have been the medium through which those suggestions have been made, whether by our contributor or by his critics.

China Clay Prospects

THE articles recently published in THE CHEMICAL AGE in connection with the applications of colloidal clay have been followed with considerable interest by those associated with the china clay industry in this country, for the industry has suffered severely as a result of the war. As is well known, activities in china clay are centred in Devon and Cornwall, and the deposits found there are unsurpassed in quality. The *Times Trade Supplement*, which has recently been giving attention to the matter, points out that an indication of the value placed upon the British clay may be gathered from the fact that several countries have now placed it on their free import list. The total production of china clay before the war was just under a million tons per annum, and, although the export trade is a large one, there is plenty of scope for any increased demand which may arise in the home market, for the deposits are said to be practically inexhaustible. In the past about 600,000 tons of the clay have been exported per annum, and this country is the only one which, owing to the special merits of the material, carries on such a business. The lack of shipping facilities dealt the industry a severe blow during the war period, as may be judged from the fact that in 1918 the quantity exported amounted to only 35 per cent. of the quantity shipped in 1913.

Unfortunately, when trade is lost in this way there is always some considerable difficulty in picking it up again, particularly as the consumers generally contrive to find a more or less effective substitute. For instance, American manufacturers, who in 1913 took half of the total quantity exported, have managed to utilise their natural kaolins, although these are decidedly uncertain as regards both quality and quantity. The chief obstacle which faces producers in this country is the enormously increased cost of recovery, and this factor alone makes it difficult to appeal with success to former customers. The most encouraging feature, however, is that stocks on the Continent are reaching vanishing point, and accordingly large quantities must be absorbed before long. There is no question that, once things begin to settle down, the revival will come, and we shall be surprised if before long the pre-war consumption in this country is not doubled.

New Issues

THE new issues of the week indicate the large scope in British industries for the investment of new capital and a continued tendency towards consolidation of interests. In addition to Lever Brothers' issue of 4,000,000 $7\frac{1}{2}$ per cent. preference shares, making their total issued capital nearly 26 millions, Brunner, Mond & Co. have made an offer for the acquisition of the business of Electro Bleach & By-Products, Ltd., which will probably be accepted. These huge combines have from the public point of view their taxes as well as their advantages, but in both these cases one may safely count on a high standard of commercial probity, a strong public spirit, and careful regard for the rights and comforts of the employees. The new issue by the British Cellulose Co. points to important developments in the chemical industry, and the application of the company's products to new industrial uses. Research work in new fields, we believe, is being very vigorously prosecuted, as one might expect under such a capable directorate, and the results are understood to be full of promise. Another interesting issue is that of the Sherbro Palm Oil Co., which has been formed to acquire a concession in Sierra Leone for the development of the palm oil industry there—a valuable and increasingly appreciated source of fats for foodstuffs and other products. Finally, the Oilfields of Egypt, Ltd., announces an issue for the purpose of prosecuting the search for oil in Egypt, and in particular of taking over and exercising the rights in respect of petroleum, oleaginous substances, oil shales, and mineral waxes comprised in three oil-prospecting licenses granted by the Egyptian Government. It is clear that, however large the fortunes made during the war, there is ample scope for their employment in the financing of new industrial enterprises.

Munitions Research

WITH the passing of war-time conditions, there must lie hidden in the archives of the Ministry of Munitions much scientific information that should be brought to light. The factories at Queen's Ferry, Gretna, and Oldbury possessed extensive laboratories, organised in conjunction with the research department at Woolwich and staffed by experienced chemists. We know that considerable success has been achieved by the workers; that success should be made public and credit duly apportioned to those who accomplished it. Some of the discoveries are doubtless of minor or transient importance; some by reason of public policy should remain the secret of the State, but problems such as the isolation of pure nitrotoluenes not merely concern the production of T.N.T. but appeal to numbers of those who have to deal with dyestuffs intermediates. The research has been financed by the national purse; it should be published in the national interest, so that manufacturers may avail themselves of such information as their needs will suggest. Apart from economic factors, the results that have been obtained probably would present much material of essentially academic import and would contribute towards justifying the contention that British patience and inventive genius

are not inferior to those of continental competitors. It seems highly desirable that, where possible, the chemical research conducted during the war should be published without delay, and we trust that the unfailing courtesy of the scientific experts concerned in this matter will not be hampered by the traditional conservatism which characterises the regulations of Government departments.

The Calendar

8	Royal Institution of Great Britain: "Modern Development of the Miner's Safety Lamp." Sir John Cadman. 3 p.m.	21, Albemarle Street, London, W.1.
8	Biochemical Society. Annual General Meeting. 5.30 p.m.	Institute of Physiology, University College, Gower Street, W.C.1.
9	Royal Photographic Society of Great Britain: Extraordinary General Meeting. 7 p.m. Papers by G. I. Higson and K. Hickman.	35, Russell Square, London, W.C.
9	Manchester Municipal College of Technology (Dept. of Applied Chemistry): "Electrolytic Chlorine and Chlorinating Plant." First Lecture. J. B. C. Kershaw. 4.30 p.m.	Manchester.
9	Society of Chemical Industry (Edinburgh and East of Scotland Section): Annual General Meeting. Paper by Mr. Norman Kemp.	Edinburgh.
10	Royal Institution of Great Britain: "Petroleum and the War." Sir John Cadman. 3 p.m.	21, Albemarle Street, London, W.1.
10	Mining Institute of Scotland: Annual Dinner. 5.45 p.m.	Grosvenor Restaurant, Gordon Street, Glasgow.
10	Royal Society of Arts: "Gas in Relation to Industrial Production and National Economy." Mr. H. M. Thornton. 4.30 p.m.	John Street, Adelphi, London, W.C.2.
10	University College, London: "The Training and Functions of the Chemical Engineer." Lord Moulton. 5.30 p.m.	University College, Gower Street, London, N.W.
11	Royal Society. Papers by W. G. Duffield, T. H. Burnham and A. A. Davis; J. H. Vincent; and H. A. Daynes. 4.30 p.m.	Burlington House, Piccadilly, London, W.1.
11	Society of Dyers and Colourists (Bradford Junior Branch): "Dyeing of Fast Colours on Cotton." G. G. Hopkinson.	Bradford.
11	Society of Chemical Industry (Bristol and South Wales Section): "Chemical Curiosities of the War." Dr. F. Francis. 7.30 p.m.	Chemical Dept., The University, Woodland Road, Bristol.
11	Society of Chemical Industry (Birmingham and Midland Section): "Catalysis Applied to Vulcanisation." D. F. Twiss. "Catalysis Applied to the Oxidation of Oils." Dr. R. S. Morrell. 7 p.m.	University Buildings, Edmund Street, Birmingham.
11	Oil and Colour Chemists' Association: "Various Points in the Manufacture of Lake and Pigment Colours." J. B. Shaw. 7 p.m.	2, Fumival Street, London, E.C.4.
11-12	Institute of Metals: Annual General Meeting. 4 p.m. and 10.30 a.m.	Institute of Mechanical Engineers, Storey's Gate, Westminster, London, S.W.1.
12	Physical Society of London: "Absorption of Gases in the Electric Discharge Tube." F. W. Newman. "A New Directional Hot Wire Anemometer." F. S. G. Thomas. Exhibit of a new micro balance, by Dr. Hans Pettersson. 5 p.m.	Royal College of Science, South Kensington, London, S.W.

The Fine Chemical Trade: Where Are We?

By a Small Manufacturer

The first article of this series gives a picture of the unfortunate position of the Fine Chemical Trade at the present time. The second article will deal with the reasons for the present position, while the third will propose a possible remedy. The matter is of such importance that we are willing to give space for its adequate discussion by those concerned.

I.—The Present Position

I AM a small manufacturer—a product of the war. I make no claim to special knowledge in this matter. I do not pretend to know all the "internals" of the trade. I write only of what I know and of what I see, and in doing so my only object is to grind the national axe of the fine chemical industry, and no other axe. In common with many others, I would gladly see all the other little axes, which are now being ground to the detriment of the trade, buried, and a great axe ground to a razor edge.

When those of us who are connected with the chemical trade awakened on that memorable day in 1914 to find ourselves involved in a world-wide war, and when after the first shock had passed we realised what it might mean for the trade, we talked a great deal of how we must all pull together and recover for England the chemical trade she had lost. And we worked towards that end—worked hard. We started many works and almost as many new societies and associations, and we made some things and tried to make others, and we were very pushing indeed.

The War's Influence

I forget how many of us started to make salicylic acid, for instance, and aspirin, and other things which the papers talked about, and odds and ends of dyes and weird things the Government wanted. There was, indeed, a multitude of effort; but the significant thing was how surprised we were to find that so few of these and many other products had been made in England before the war, and how very thin indeed was the division between the despised merchant and the manufacturer. It was a rather shocking revelation, and, if I remember rightly the gist of all but a small percentage of the speeches, papers and discussions, we said over and over again, and yet again, that it really was very disgraceful, and should never have occurred; that it must be remedied at once, and must under no circumstances occur again.

The scientific societies got to work individually, and were very angry because the Government would not recognise science properly. The big manufacturers got to work also, and were very angry because of the crass stupidity of Government departments on scientific matters. And there sprang into being a host of little manufacturers—I was one—who were very angry, too, because they were short of capital and could not get going fast enough, and did not know what to touch and what to leave alone.

A Dream Dance

Indeed, the result on looking back reminds me of a scientific definition (if it be a scientific one) of a dream. All the cells of the brain, big and little, awaken, as it were, in the dark, to find themselves leaderless. They throw out tentacles here, there and everywhere, and these tentacles intertwine, touch and separate again, emerge and return, and produce as a whole a mad conglomeration of unproductive effort. Although here and there the effect produced is clear and well defined, the whole is chaotic and disturbing. But a dream is a dream, and even a tragic one is a matter for jest over the breakfast table. The dream dance of the English fine chemical trade is, or may be, a tragedy when the real awakening comes. For the dream goes on now five years after the commencement, and the awakening seems as far off as ever. Observe some of the facts.

The capital involved in the manufacture of fine chemicals in this country, as distinct from dyes and heavy chemicals, has not increased in anything like the proportion it must do if the trade is to be held. The capital at present involved in the trade is only a mere fraction of that employed in Germany before the war, and some day to be employed again.

Lack of Co-operation

It is probably true that if all the effective space in the fine chemical factories in England were gathered together in one place the whole could be accommodated in one or, at the outside, two of the great German factories. Several factories started for the manufacture of certain fine chemicals are already out of commission. A large number of processes

started by big and little firms for the manufacture of fine chemicals have been stopped. The importation of fine chemicals for the export trade particularly has increased, not only through merchants, but through manufacturers as well.

At a venture, it might be said with some truth that not more than a small percentage of the chemicals listed by English fine chemical manufacturers are actually manufactured in this country. Notwithstanding societies for this and associations for that connected with the trade, there is little or no cohesion. There is too little co-operation either as regards raw materials, finished products or by-products. The great chemical societies have yet to come to a common understanding, though they have had five years in which to agree.

There are movements in the right direction, no doubt; efforts have been made and are being made, but all in the dark. Everything is "Private and Confidential," "Strictly in Confidence" and the rest of it. We are suspicious of our fellow-members in the societies to which we belong, mistrustful of our fellow manufacturers and scared to death lest the world should know what we are doing.

These things are true now as they were five years ago, when the fine chemical trade of England was a mere cipher in the world, and gone as it seemed for ever.

The Demand for Fine Chemicals

One has only to talk to chemical merchants to realise what the position really is. Ask them how much of the fine chemicals they sell are made abroad and how much at home. Ask the universities and technical colleges how they get on for research chemicals. The answer will always be the same—that they cannot get what they need in England. Consequently the clamour for unrestricted importation of fine chemicals into this country is increased.

The demand for fine chemicals is enormous, and the English fine chemical manufacturers cannot supply the home market from their own production, let alone the foreign markets. And yet the great competitor is still "down and out"—without the raw materials, without coal and without transport, threatened with worse things still, and almost hopeless.

Before the war, Germany employed millions of capital for the production of fine chemicals, and, as I have stated, the English capital involved at that time was pitifully small. There has not been, as far as I know, one really large public issue of capital for this purpose in England. During the last few months of 1919 the new capital issues in England were extraordinarily numerous and heavy, but there was not one amongst them for fine chemicals proper.

There has been during the past five years a perfect fury of research. Every chemist in the land almost has a process up his sleeve, perhaps many. One wonders what becomes of them all, or if the majority are either no good—which I do not believe—or wasted.

It is not material to the point at issue who or what is responsible for this state of things, but it is well that those who are connected with the fine chemical trade of England should look the matter in the face. The tendency seems to be—and it is a tendency peculiarly English—for each individual to recognise and denounce the situation, but to apply it to everyone except himself.

It is not very flattering to hear the story of an English visitor to a chemical factory in Germany, who, after having been shown everything and having had the processes explained to him, asked his guide what would happen if he went back to England and told the English manufacturers everything he knew. The German guide was quite clear upon the point, and said: "By all means do so, for by the time your English manufacturers have made up their minds to adopt the process, and have got to work, we shall probably have a better process still."

It does not seem to me to be worth while to mince the matter in any hackneyed phrases. The fine chemical trade of England is not progressing. Indeed, the present state of the trade is such that if pre-war conditions prevailed again, or anything approaching them, the trade could not maintain its present position for six months.

A Diagnosis.

It is only repeating a truism, which has often been said since the war broke out, to say that the opportunities that the trade has had, and still has, to establish itself are such that it will never have again. But we are a trade without effective co-operation, although we are a trade peculiarly adapted for it. If it has been possible in Germany and in other countries for the large chemical manufacturers to devise a scheme which will co-ordinate the trade and yet neither harm nor destroy the individuality of the manufacturer, it should surely not be beyond the wit of the leaders of the fine chemical trade in England to devise a similar scheme for the general protection of the trade. It has been done in England in other trades, notably in the steel trade. One wonders why it has not been done in the fine chemical trade.

I believe that the reasons may be briefly summed up as follows, and in stating these reasons I disclaim any desire to criticise, but only to state plain truths in order, if possible, to repair defects—

- (a) We all suffer from a short-sighted insularity in our work.
- (b) The leading fine chemical manufacturers as a body are not guiding the trade aright.
- (c) The small chemical manufacturers (I am not sure that it is limited to the small chemical manufacturers) show unworthy suspicion and lack of trust.
- (d) The leading chemical societies, which should have long ago given a sound lead towards co-operation, seem to the comparative outsider to suffer from individual pride, prejudice or jealousy, or all of them.

We are told that the great business of the manufacturing industries of the country is to produce more and more. The fine chemical trade of England is producing, if not less and less, certainly not more. The year 1920 is prophesied to be a boom year. What chance is there as things stand at present of the boom being felt or taken advantage of by the fine chemical trade? We are a trade to-day of immense prospects and unlimited demands to supply. We have spent five years in mending patches or trying to mend patches of a structure the very foundation of which is insecure and almost unformed. On a single point this accusation stands supported. The aggregate waste in the fine chemical trade in England to-day must be enormous. The overlapping in work and research is deplorable. Is it inconceivable that there is no person or group of persons broad-minded enough, farsighted enough or self-sacrificing enough to give us all the lead we want to bring the trade together as one great whole, without interfering with the rights and interests of any individual person?

Chemists and Labour

To the Editor of THE CHEMICAL AGE.

SIR,—The sentiments expressed in Mr. Ivor James's letter in your issue of February 28 are not, so far as I can see, in any material respect at variance with the views of the Council of the British Association of Chemists, but exception must be taken to the totally misleading sentence with which his letter opened, in which he spoke of "the projected rapprochement between the National Union of Scientific Workers and the British Association of Chemists on the one side and the Labour Party on the other." Let me assure Mr. James that such a "rapprochement," so far as the B.A.C. is concerned, never was projected, and is utterly opposed to the policy of the Association. It is unfortunate that no full report of the Essex Hall conference, with the exception of that emanating from the Labour Research Department, has yet appeared. At that meeting, as reported in your issue of February 20 (p. 223), an amendment to the official resolution was moved, on behalf of the technical societies, specifying that the proposed new federation should be "independent of the employers' unions on the one hand and of the manual workers' on the other, and free to negotiate with both in the best interests of the professional workers." This amendment which was supported by the B.A.C., was lost, and it became evident that the majority of the associations represented at the conference looked to the Labour Party for salvation. The B.A.C. representatives took no further part in the proceedings.

May I add that it is my personal conviction that neither by joining the Labour Party nor by adopting Trade Union methods

can chemists hope to improve their status? The touchstone of success is a high standard of qualification commanding universal respect and confidence. A chemists' association, to be successful, must insist on a high qualification. It was hoped at one time that the Institute of Chemistry would undertake to compile a register of qualified chemists, and to have the term "chemist" legally re-defined. Had the Institute seen its way to accept this programme, the British Association of Chemists would never have been formed. That is a matter of history. These issues are still embodied in the programme of the B.A.C. Now, according to your issue of February 28 (p. 225), the same points—the definition of a "chemist" and the need for a register—were brought up by Mr. J. W. Black at a meeting of the Chemical Industry Club. A wish was expressed at that meeting "for some united body capable of acting for chemists as a class." The same wish was expressed by a huge gathering of chemists in Manchester 2½ years ago, and as a result the British Association of Chemists was formed. This association still exists and its membership is increasing rapidly. The organised body for which chemists are again asking is already in being, waiting for them to join. Once joined, they can frame its policy as they desire.—Yours, &c.,
E. H. R.

Colloidal Clay in Soap Making

To the Editor of THE CHEMICAL AGE.

SIR,—Concerning Mr. F. E. Weston's recent very interesting article on the value of colloidal clay as an adjunct in the manufacture of soap, and having regard to the various criticisms thereon which have since appeared in your columns, the writer would like, from the standpoint of practical experience extending over several years in the manufacture of soap detergents prepared from a rare quality of kaolin clay, or properly, aluminium silicate—for use in the scouring of wool, yarns and piece goods, as well as for other industrial purposes—to be allowed to add his complete endorsement to Mr. Weston's findings.

Although Mr. Weston has in his able treatise to a very large extent enlightened your readers with respect to certain technical advantages derivable from the inclusion of true colloidal clay in soap-making, we claim to have knowledge of several further important functions performable by this valuable body when put into aqueous solution. We would like to point out to your interested readers that as far back as 1910 our present process was patented by the writer in the Dominion of New Zealand and the Commonwealth of Australia; also, in Great Britain, Germany, Austria, &c., in the following year. After fully establishing the commercial utility of the invention in Australasia, and receiving large encouragement there, the writer decided, prior to the outbreak of war, to come to Yorkshire, as the wool centre of the world, for the purpose of introducing his product "Loftine" as a scouring agent, and on its merits and cheapness he has experienced little difficulty in getting it largely adopted by the trade. The late Sir William Crookes, O.M., F.R.S., who thoroughly investigated our process, thought very highly of it, as may be gathered from his report (enclosed).—Yours, &c.,

41, St. Paul's Street, Leeds. LOFTINE, LTD.
February 18. LANGLEY SHAW, Managing Director.

Another Profit Sharing Scheme

LAST week we published a brief outline of the profit-sharing scheme in operation at the Whitefriars Glassworks. Such schemes are becoming increasingly popular all over the country, and the evidence shows that the results have been very satisfactory in most, if not all, cases.

At the annual general meeting of John Knight, Ltd., on February 27, Mr. John W. Hope, C.B.E. (chairman and managing director), referred to the scheme adopted by the company, which is somewhat similar in its application to the one described in these columns last week. The scheme provides that for every ½ per cent. in dividend paid over 5 per cent. on the ordinary shares the workers receive one-half week's extra wages. This is paid as to half in cash and half in special certificates carrying the same dividend as is paid on the ordinary shares, thus giving all helpers a real interest in the furtherance of the prosperity of the business. The dividend which the meeting was asked to confirm (12½ per cent.), said the chairman, would, therefore, entitle all the profit sharers to 7½ weeks' extra remuneration, which was equal to 15 per cent. upon their present rate of wages.

The Properties of Powders

Paper by Prof. Lowry and Mr. J. C. Hemmings

A JOINT meeting of the London Section of the Society of Chemical Industry and the Faraday Society was held on Monday, March 1, when the subject of the properties of powders was discussed.

Mr. JULIAN BAKER, chairman of the London Section, presided at the beginning of the proceedings, and referred, with regret, to the death of Prof. T. Emerson Reynolds, who was President of the Society in 1891-2.

Prof. A. W. PORTER, F.R.S., then took the chair as representing the Faraday Society.

The first paper was by Prof. T. Martin Lowry, F.R.S., and Mr. J. C. Hemmings on "The Properties of Powders":—

The Study of Powdered Solids

Although much attention had been paid to the general properties of solids, liquids and gases, and also more recently to the study of matter in the disperse or colloidal condition, the study of powdered solids, the authors stated, had received less attention than its importance would appear to demand. There was a considerable range of properties of powders in reference to which very few scientific observations had been made, although they were of sufficient technical importance to justify full consideration in order that industry might have the benefit of carefully collected data and of a scientific key to the solution of its practical problems.

Amongst the properties of powders which deserved consideration, the following were mentioned: The production of powders by mechanical disintegration or milling, and especially the process of fine grinding; disintegration by physical processes; disintegration by chemical processes; methods of testing; incorporation of mixed powders; bulk density of a powder; compressibility of powders; flow of powders; shrinkage or contraction; and caking. Attention, however, was concentrated upon caking of salts, and special attention was devoted to the caking of ammonium nitrate. The agreed causes of caking in soluble salts were summarised as: evaporation of moisture; mechanical stress; recrystallisation of fine particles; recrystallisation of metastable crystalline forms and the recrystallisation of amorphous material.

Attention was first directed to the caking of powdered solids by observations made in the case of ammonium nitrate. This salt crystallised from aqueous solution in long needle-shaped or prismatic crystals which might run to a length of several feet. These carried a considerable proportion of moisture not only on the surface but in the interior. If allowed to dry spontaneously in the air, the crystals bound slightly, but no very great cohesion was observed in the mass which could easily be broken down again. It was when the crystals were dried in any of the commercial forms of drier that caking took place, often of a character which left the ammonium nitrate in the form of a stony mass. Caking of an equally marked character had been found to occur in ammonium nitrate which had been poured out in a molten state, with a small percentage of moisture, at a temperature a little below the melting point of the dry salt. Again, after milling for an hour and leaving under a gentle pressure all night distinct caking had been observed, although the temperature of the nitrate had not risen during milling to the transition temperature at 32 deg. When ammonium nitrate was dried by heat changes of state occurred at 32°C. and 84°C. It was thought at one time that disintegration rather than caking followed the expansion which accompanied the change of state on heating through 32 deg. or on cooling through 84 deg., and that caking as a result of change of state took place on cooling through 32 deg. and possibly on heating through 84 deg., following upon contraction of volume. This view could not be maintained, however, in view of the fact that crystals which had been disintegrated by heating to a temperature between 32 deg. and 84 deg. formed an extremely hard cake within an hour or two after packing, and probably a whole day in advance of passing through the transition temperature of 32 deg.

The recrystallisation of fine particles, mechanical working, and compression were then studied, but the conclusion arrived at finally was that the key to all the observations that had been made on the caking of ammonium nitrate was to be found in the effect of drying, grinding, milling, &c., on the moisture in the salt. Conclusive proof of this was obtained when it was found that whilst commercial drying at a high temperature was always followed by caking, it was possible in the laboratory to carry the drying of the salt to a point at which it could be kept indefinitely as a loose powder under precisely those conditions which had been found to provoke the hardest caking.

The Authors' Conclusions

The conclusions finally arrived at in reference to the cause of caking of ammonium nitrate were as follows: (1) Caking was not caused directly by change of state, but this gave rise directly only to disintegration and to liberation of moisture from the partially dried crystals; the immediate cause of caking was, then, the cementing effect on the tiny particles of the disintegrated salt of moisture released during the change of crystalline form; (2) Liberation of enclosed moisture could also be effected by mechanical disintegration and this might give rise to caking in precisely the

same way as the disintegration and liberation of moisture consequent upon change of state, although the effects were much less pronounced. In the absence of moisture, mechanical disintegration would probably not give rise to caking; (3) In an edge-runner mill, the moisture was able to evaporate as fast as it was released by milling. Under these circumstances the effect of the released moisture was only slight and the mechanical working did not suffice to produce any serious caking of the salt.

The same phenomenon was encountered amongst other compounds, and a large number of other compounds were examined in the laboratory, and in certain cases it was possible to make useful suggestions with a view to reducing the tendency of the salt to cake. The substances giving rise to the trouble of caking were ammonium nitrate, sodium nitrate, potassium nitrate, copper nitrate, potassium chlorate, potassium perchlorate, potash alum, citric acid, and tartaric acid, soda ash, common salt, borax, sodium sulphite, sodium hydrosulphite, sodium phosphate and Rochelle salt, and the majority of them were examined in the laboratory. The view that water played an important and perhaps a vital part in the caking of powdered salts was confirmed by experiments in which the attempt was made to produce caking in an insoluble compound. The substance selected for the purpose was calcite. The experiments on hydrated salts, together with those on dry ammonium nitrate, proved clearly that both caking and contraction could be avoided if all traces of free solvent were removed, and among the final conclusions arrived at in order to prevent caking were that care should be taken to reduce to a minimum the number and amount of soluble impurities; when possible the substance should be left in large crystals as the fewer the number of points of contact the smaller would be the tendency for the material to bind together; when a finer product was required the most satisfactory way of supplying it was in minute unground crystals; when a substance was specially required in a finely powdered form, there should be careful drying with agitation, after grinding; as far as possible the drying should be carried out at low temperatures; substances should not be packed hot unless all traces of moisture had been removed; steps should be taken to maintain a dry atmosphere during packing; care should be taken to prevent access of moisture to the substance after packing; and caking might be minimised by keeping the temperature as constant as possible during storage.

An Interesting Discussion

Dr. J. A. HARKER, F.R.S., speaking with regard to the properties of ammonium nitrate, said that about three years ago he had to go into the question of the manufacture of ammonium nitrate from calcium nitrate and it was pointed out what a very round about process this was. In conjunction with Dr. Partington and Dr. Rideal, who were members of the staff of the research laboratory of the Ministry of Munitions, the question was gone into and they found that, in spite of the statements in the text books that it is impossible to build up ammonium nitrate synthetically from its constituents, it was possible to do so. It was found that ammonium nitrate could be got direct from its constituents and this promised to be a very important process. There was not time to go into the whole question crystallographically, but the crystalline formation of the substance was rather remarkable. It was found that the ammonium nitrate was formed from its gaseous elements by the interaction of the gases obtained from the oxidation of ammonia. The whole question would be dealt with later in the proper place, but what he wanted to say now was that the ammonium nitrate obtained in that way was nothing like so deliquescent as ordinary ammonium nitrate. The two forms picked up water at very different rates. If a bottle were filled with the ammonium nitrate formed in the manner he had mentioned it would be found that in the morning the crystals would have sunk to about 20 per cent. of their original volume, but nothing more happened and what remained was in the form of very fine, almost microscopic crystals, which did not cake even with long keeping, and it was not so deliquescent as ordinary ammonium nitrate.

Prof. PORTER asked if the difference was due to the crystalline form.

Dr. HARKER said he could not dogmatise about it at the moment, but he thought the question of temperature came into it.

Mr. BERRY said he had had 25 years' experience of the caking of chemicals, but he thought that the manufacturers of ordinary table salt many years ago had solved the problem of caking, and he would like to ask Dr. Lowry if when attacking this problem of ammonium nitrate he had made any enquiries of the Cerebos salt people, in which company, by the way, he had no interest, because he could not help feeling that they could have thrown a flood of light on the matter. He believed that the caking was entirely due to the question of moisture. It was perfectly true that the moisture existed in different conditions but if they had an anhydrous salt and ground it, the problem of caking was overcome. He remembered one salt works in which packets came back caked. The salt was taken out and ground again after drying and it did not cake. The explanation was as Dr. Lowry had brought out in his Paper. In the first drying of the salt the bulk of the moisture was driven off, but there remained the inner moisture of the crystals and it was this latter which was removed on the second grinding of the salt to

which he had referred. There were physical changes brought about in drying due to the temperature and if the drying in the case of chemicals was hastened, there was bound to be caking, and caking also occurred when the drying was at too high a temperature. It was impossible to lay down any hard and fast rule as to drying. If sodium phosphate contained as much as 30 per cent. of moisture it would not cake under some conditions whilst under others caking would take place with 10 or 15 per cent. of moisture.

Sir ROBERT ROBERTSON said the formation of pellets was analogous to the phenomenon of caking, and a good deal of work was still required to be done on the question of the preparation of pellets. The analogy might not appear to be quite clear. In the case of ammonium nitrate, when perfectly dry or with a moisture content of the order of 0.02 per cent., it would form into a pellet of definite cohesion with a certain pressure, but to get the same cohesion with about 2 per cent. moisture less pressure was required.

Dr. S. RIDEAL said that Dr. Lowry had left out the question of salt cake, and that reminded him of an experience during the Boer war. In connection with the typhoid troubles in that war attempts were made to sterilise water by means of sulphuric acid. He himself suggested that salt cake should be used and the New Zealand Government suddenly ordered 4,000,000 tablets of bisulphate of soda for this purpose. It was found that 15 grains of salt cake to a pint of water would sterilise water from typhoid, but when they came to make the pellets great difficulties were encountered with the machine, the pellets all sticking together. The difficulty was overcome by lubricating the machine by boric acid and this prevented the caking together of the salt cake into greater masses than 15 grains. When these pellets went out to South Africa they were dumped in Cape Town and never went up to the front, and eventually they came home two or three years afterwards and were found to be caked so hard that they could not be dissolved in water. That difficulty was overcome and eventually the pellets were used in the Russo-Japanese war by introducing a little carbonate of soda.

Capt. GOODWIN suggested that a further line of investigation might be in the direction of the effect of the impurities in the material. In the case of ordinary table salt he believed that one of the chief impurities which tended to cause caking was calcium sulphate, whereas in another case fairly well known to the explosives trade, sodium nitrate, it was found that to prevent deliquescence it was necessary to remove the sodium chloride.

Mr. J. G. A. RHODIN did not think that hydration had so much to do with the caking of salts as Dr. Lowry seemed to think. Caking was due, he believed, to cohesion turning into adhesion between the crystals. During the past fortnight he had been using Portland Cement as the hearth for smelting metal at high temperatures and after a temperature of 1,200°C. for about a fortnight it still held good.

Dr. R. LESSING said the presence of acid in the salt had not been mentioned, and he would like to know whether the original nitrate and also the nitrates at various temperatures of transition were perfectly neutral or whether they contained either a trace of free acid or free ammonia. In the case of ammonium sulphate it was found practically impossible to dry it unless the salt was neutralised, and grinding was resorted to. As an alternative theory of caking, he thought it possible that there might be a certain amount of dissociation at the high temperature of 70 deg., which would form nitric acid and free ammonia, and that caking would take place or be facilitated on the re-combining of the disturbed fragments of the molecules. This would also explain why it was that caking took place suddenly after drying. One rather important matter in connection with ammonium sulphate was that the acidity was not always due to free acid but almost invariably to pyridene, which formed acid sulphate which could never be got entirely neutral, and that would result in some dissociation taking place, and he was wondering whether some such dissociation might not take place in the case of ammonium nitrate.

Mr. R. G. EARLY gave a number of figures to indicate the pressure required to produce coherency in a number of soluble and insoluble salts and the percentage of mother liquor required to be present to facilitate easy pressing. These showed that very small percentages only were necessary. The conclusions he had arrived at were that solubilities and pressures did not run in parallel. These processes of pressing, however, were relatively rapid, and there was no time for the conditions to mature as in the case of ordinary setting.

Dr. LOWRY briefly replied to the discussion. He said he had tried to get some information from the Salt Union but had not succeeded in getting very much. His opinion was that impurities were the dominating factor in the case of salt and were the chief factor in preventing caking. As to whether caking might be due to dissociation or whether ammonium nitrate was neutral, as a matter of fact it was very nearly neutral. The English ammonium nitrate was always boiled down to crystals and that was why it was free from pyridine. With regard to the causes of caking, he was convinced that in many cases other causes came into play, but he was a believer in the theory of amorphous materials and he had been pretty sure that this theory accounted for the caking of salts and he had wanted to attribute it to this, but he had been shown that

water was the key to the trouble, as had been seen by the sample of material which did not change its state as regards caking whatever was done with it.

The second Paper by Dr. Lowry and Mr. Wilding was a short note intended more as a contribution to the general discussion, dealing with the setting of dental cements. It was a classification of the various dental cements and the causes of setting and caking. There was no discussion.

Institute of Chemistry

Annual Meeting

At the 42nd annual general meeting of the Institute of Chemistry held at 30, Russell Square on Monday, Sir Robert Robertson, Vice-President, occupied the chair in the place of Sir Herbert Jackson, the President, who was absent through illness.

In moving the adoption of the report of Council, Sir Robert read the President's address in which reference was made to the position of professional men under prevailing economic conditions. Notwithstanding the limited number of appointments carrying reasonably high salaries and the difficulty of rising above the standard of mediocrity, most of the professions were attracting such a high proportion of the educated youth of the country that they were likely to be overcrowded. On the other hand, the Government and the industries of the country were becoming more and more alive to the necessity and the wisdom of making appointments for chemists more attractive to the best qualified. In order to secure better remuneration and conditions of appointment chemists were urged to do all in their power to render themselves prepared for such opportunities as came their way. The Institute was ready to help them to secure suitable appointments, and endeavoured to encourage the employment of the competent. The situation was far more promising than at the time of the armistice; over 530 chemists whose names had been on the Appointments Register had now no further need of this assistance.

The Institute had been in communication with several of the Whitley Industrial Councils for industries on which chemistry had a bearing, and although under the constitution of the Whitley Councils no provision was made for the direct representation of chemists, several were acting as employers' representatives, and the Councils were prepared, where occasion arose, to turn to the Institute for assistance. The roll of the Institute was steadily increasing, numbering nearly 3,000 Fellows and Associates, and over 500 Registered Students. The Council were engaged in work of reconstruction: remodelling the bye-laws, providing for district representation on the Council, and revising the regulations for admission to the membership. They had taken up the question of securing representation of chemistry in the Ministry of Health, with the satisfaction of seeing Sir William Tilden appointed a member of the Council on Medical and Allied Services, and Dr. J. F. Tocher appointed chemist to the Scottish Board of Health. Attention was being given to the continued production by British manufacturers of glass apparatus, chemical reagents and other laboratory requirements which hitherto were obtained mainly from Germany and Austria.

Jointly with the Institute of Metals, a Committee was engaged on questions affecting the status and organisation of chemists and metallurgists with the Navy, Army and Air Force. Mention was made of the activity of the local sections and of the help rendered by them and the honorary corresponding secretaries overseas in the work of the Institute.

Election of Officers

The Officers and Members of Council for the year 1920-21 were elected as follows:—

President: Sir Herbert Jackson, K.B.E., F.R.S.

Vice-Presidents: Horatio Ballantyne; Sir James Johnston Dobbie, LL.D., F.R.S.; Ernest Mostyn Hawkins; Gilbert Thomas Morgan, D.Sc., F.R.S.; Sir Robert Robertson, K.B.E., F.R.S.; George Stubbs, O.B.E.

Hon. Treasurer: Edward William Voelcker, A.R.S.M.

Members of Council: Walter Ernest Adeney, D.Sc., A.R.C.S.I. (Dublin); William Bacon, B.Sc. (London); Edward Charles Cyril Baly, O.B.E., F.R.S. (Liverpool); Oscar Lisle Brady, D.Sc. (London); Francis Howard Carr (Nottingham); Alfred Chaston Chapman (London); Allin Cottrell, M.Sc. (Gretna); Alexander Charles Cumming, O.B.E., D.Sc. (Edinburgh); John Thomas Dunn, D.Sc. (Newcastle); Lewis Eynon, B.Sc. (London); Alexander Findlay, M.A., D.Sc., Ph.D. (Aberdeen); George Watson Gray (Liverpool); Frank William Harbord, C.B.E., A.R.S.M. (London); Charles Alexander Hill, B.Sc. (London); Patrick Henry Kirkaldy (London); Joseph Henry Lester, M.Sc. (Manchester); William Macnab (London); Samuel Ernest Melling (Manchester); Gordon Wickham Monier-Williams, O.B.E., M.C., M.A., Ph.D. (London); Andrew More, A.R.C.S. (London); Frederick Mollwo Perkin, Ph.D. (London); George Henry Perry, M.B.E., B.Sc., A.R.C.S. (London); Benjamin Dawson Porritt, M.Sc. (Edinburgh); Francis Martin Potter, M.B.E., B.Sc., A.R.C.S. (London); John Rogers, O.B.E. (Glasgow); Ernest Woodhouse Smith, D.Sc. (Birmingham); William Maurice Gathorne Young (Doncaster).

Filtration and Softening of Water

Second Lecture by Dr. G. Grant Hepburn

THE second lecture of the series upon "Water Supplies: their Filtration and Softening," by Dr. G. Grant Hepburn, was delivered at the Manchester College of Technology on Tuesday, February 24, to a crowded audience.

Treatment by Chemicals

After a brief reference to his last lecture Dr. Hepburn said the chemicals used in filtration were sulphates of alumina, and if the water had no alkalinity due to calcium magnesium or sodium bicarbonates then there must be added to it, in order to precipitate the alumina, carbonate of lime in the form of whiting or lime water, the former being preferable because it might happen, in adding the lime water, that an excess of lime was added, and with water containing free lime the solution pressure of lead was very much less than with a neutral water; so that instead of preventing lead poisoning an innocent water in this way might cause lead poisoning. The quantity of sulphate of alumina used for the purification of town's water varied between $\frac{1}{2}$ grain and $1\frac{1}{2}$ grains to the gallon—i.e., between 71 lb. to 213 lb. to the million gallons. The sulphate of alumina was thoroughly mixed with the water, and was co-extensive with the presence of water meeting carbonate of lime or free lime in the water. Alumina separated out throughout the whole mass of water, and, for the purposes of the lecture, could be imagined as doing so in the form of an extremely fine "net." This "net" gradually drew together, and broke up into ponderable particles—or "coagulated." In this drawing together it enmeshed or sieved out the bacteria and the finest suspended matter, imprisoning them in its substance. The particles of alumina finally became of such size that they could not pass through the bed, and were, together with their bacterial content, retained by it. The precipitation of the alumina in visible form took a little time, this varying with the amount of active chemicals present and the nature of the water, so that the water might even be fed to the filter and arrive at the surface of the bed before there was any visible precipitation of alumina; but almost immediately it came in contact with the sharp quartz or sand of the bed, precipitation took place, attended as before by the enmeshing of the bacteria. But as filtration proceeded the upper layer of quartz or sand became coated with alumina, and coagulation of the alumina took place at lower and lower levels in the bed.

This was a point of first importance in mechanical filtration, for if the whole of the alumina were precipitated instantly on coming in contact with the top layer of the bed, the filter would very rapidly get "plugged up," and rapid mechanical filtration in many cases become impossible owing to the necessity for frequently washing the bed, or, in the alternative, beds of very large area would have to be used. In the case of a Madeira sugar factory he had seen a bed plugged up in half a minute owing to the whole of the suspended matter being separated by the top layer of the quartz.

The removal of colour, due to the presence of peat in waters, appeared to depend upon the fact that when two colloids of opposite electric charge came together both were precipitated. Alumina and peaty matter appeared to be two such colloids, with the result that the colour was removed.

The Addition of Chemicals in Proper Proportion

It was of the utmost importance that the sulphate of alumina be added to the water only in such quantity with respect to the carbonate of lime that hydrate of alumina or a very basic sulphate of alumina (i.e., one that dissociates quickly on large dilution) be formed, otherwise the alumina would pass through the bed in solution and precipitate only after filtration; so that the filtrate after standing for an hour might contain more suspended matter than the raw water. Fifteen to 20 years ago the practice was simply to throw a block of sulphate of alumina into a box and by-pass part of the water through the box. When that block of alumina was new it presented a much larger surface to the water being by-passed through the box, and therefore very much more sulphate of alumina would be added to the water than later on when most of the block had dissolved away. The inevitable result of such a practice was that with a new block there was precipitation of the alumina in the filtrate after filtration unless the water contained naturally sufficient carbonate of lime to precipitate it. This would be followed by a period of good filtration, and later a period of bad filtration due to an insufficiency of sulphate of alumina.

The application of rapid mechanical filtration of town's supplies necessitated that the chemicals should be added in their proper proportions. Illustrations were then given of the various types of apparatus, by means of which this object was effected. These included one devised by the Paterson Engineering Co., Ltd., of London, and several in which the principle of the Venturi tube was applied.

Water Motors

Another method of proportioning the chemical addition to the rate of flow was that of the water motor, which consisted of an outside cylindrical body, closed at each end by a back and front cover, and provided with an inlet and an outlet for the water. Inside the body there was a drum whose axis was eccentric with the axis of the

cover or outside body. The eccentricity was such that the lower part of the drum just cleared the outside body, while in the upper part a space was left for the passage of water. Round the axis of the drum there were eccentric blocks carrying blades extending along the whole width of the drum and free to slide on the blocks. The blades passed through the circumference of the drum, and just cleared the outside body. As the water entered it forced a blade round and the drum round, and as it was forced round, on account of the eccentricity and freedom of the blades to slide on the eccentric blocks, the blades were always kept just against the outside body no matter what the position was. Each revolution of the drum corresponded to a definite volume of water. On the shaft of the drum there was a sprocket wheel, which by a chain drove an eccentric, which, in turn, was made to drive the plunger of the pump. The stroke of the pump was so adjusted that a definite volume of solution was added for each stroke.

Chemicals having been added to the water, and filtration having gone on for a time until the loss of head in the bed had risen to 8 lb. per square inch, the period, perhaps, being 12 to 24 hours, the suspended matter penetrated so far into the bed that if filtration was to be continued the filtrate would begin to be opalescent and of bad quality. The time had, therefore, arrived when this loss of head was reached for washing the bed.

Dr. Hepburn then described the Mather & Platt filter for rapid mechanical filtration.

Comparative Results

The purifications effected by rapid mechanical filtration were equal, or superior, to those attained in submerged sand beds. For example, in the case of bacteria without chemical treatment the percentage removed might only be as high as 25, though it might rise to 60, but with chemical treatment it rose to between 97 and 100 per cent., while the organic matter purification was from 20 to 75 per cent., depending upon the nature of the water.

Dr. Hepburn then exhibited graphs illustrating bacteriological and albuminoid purifications, dealing mainly with the results obtained with Bell Brothers' filters in the case of the Edinburgh and the Bolton water supplies, showing the curve for bacteria developed on gelatine and on agar.

It frequently happened that waters contained carbonate of iron in solution. With exposure to the air such a water became troubled through the oxidation of the iron and the separation of the ferric hydrate. Filtration alone, for such a water, was useless. It should, first of all, be aerated to oxidise the iron and then filtered to remove the precipitated ferric hydrate. A photograph of an installation for aeration and the removal of iron was then exhibited. The raw water was delivered by a pipe on to perforated trays, from which it fell in the form of rain, so that a very extensive area of water was exposed to the action of the air, two or three trays being sufficient. The water then fell on a coke bed, where still further oxidation took place, and from there it was led by gravity and delivered to the filter. This method for the removal of iron was very effective. For example, the whole of the Newquay (Cornwall) water supply, which contained 1.2 parts per 100,000 of iron, reckoned as ferric oxide was dealt with in a plant similar to the one shown on the screen. The Foleshill supply was treated in the same way. The working value of the bed was 170 gallons to the square foot an hour for a thickness of coke bed of 4 ft. Such a bed, and method of feeding it, removed iron effectively. The filtrate contained a quantity of iron that was of no practical importance whatever, amounting only to 0.01 of a part of oxide of iron per 100,000. Nevertheless, it was astonishing what small quantities of iron might make a water unfit for certain purposes.

Cotton Conditioning and Bleaching

In the case of cotton conditioning and bleaching a quantity of iron equivalent to only 0.02 or 0.03 part of ferric oxide per 100,000 was sufficient to condemn that water. A case occurred in Wigan where they were using the town supply. The water contained only 0.02 of a part per 100,000, but it turned the cotton hanks quite a buff tint. Again, at a bleachworks in Dunfermline the quantity of iron, expressed as ferric oxide, was only 0.03 of a part per 100,000, yet it was impossible to work satisfactorily with the water until aeration and filtration were adopted.

There was another way in which iron in water might lead to very serious trouble—i.e., if the bacillus of the thread variety, viz., *Crenothrix polymorpha*, got into the pipe line. If a water contained more than 0.033 of a part of iron, expressed as ferric oxide, per 100,000, this bacterium could live and thrive; less than that meant for it starvation and death. It anchored itself to the side of the pipe, and there settled down to extract its nourishment which, in part, was iron. The result was that the colonies of bacilli localised the iron and so choked the pipes effectually. Aeration and filtration gave a water in which these bacilli could not live on account of its low iron content.

Slides of the filters of the Kennicott Water Softener Co. and of the United Water Softeners, Ltd., were next thrown on the screen and shortly described, and a photograph was shown of a complete Mather & Platt installation for the Ashton-under-Lyne, Stalybridge and Dukinfield Corporations, consisting of 18 8 ft. pressure filters dealing with $2\frac{1}{2}$ millions gallons per diem of 24 hours. A remarkable

point in connection with this plant was the smallness of the ground area required.

Sand beds corresponding to the filters within the installation house would cover about 4 acres of land for the same output. Another installation was that of Bell Brothers for dealing with the Stockport Corporation Water supply, and which had an output of 3 million gallons per diem of 24 hours. In this case the filter house was 180 ft. long by 39 ft. 6 in. wide, and the filters contained corresponded to a submerged sand bed area of over six acres, working at 2 million gallons per acre. The convenience of having filters housed in such a small space could easily be imagined.

Steel v. Reinforced Concrete

During the past few years there had been a tendency to depart from the use of steel filters and adopt designs made with reinforced concrete. The pioneer company in this direction was the Paterson Engineering Co., London. Such a filter had very much the same appearance as an ordinary sand bed filter. The water was led on to the bed through a trough which also acted as a waste trough. As the water was let in the level, of course, naturally rose, but no filtration took place for a little time, a float keeping the outlet valve closed until a certain level was reached. In the 15 minutes elapsing there was time for a light film of alumina, in alumina treated water, to form upon the top of the quartz bed. Filtration took place through the quartz bed, which was supported on a bed of gravel, through which the water found its way through nozzles into collecting pipes, thence into a valve and away.

Views of a Paterson installation were then shown. The Paterson Co. had erected installations in many parts of the world. At home they had put up a six million gallons a day plant near Glasgow, a 10 million gallons a day plant at Gretna, while at Kobe, Japan, they had installed an 8 million gallons a day plant, and a 20 million gallons a day plant at Hyderabad.

The relative cost of steel and reinforced concrete filters was much about the same, but for large schemes concrete presented a much neater finish and was as indestructible as masonry.

Submerged Sand Beds v. Mechanical Filters

As regarded the comparative cost of a submerged sand bed against a mechanical filter the initial cost for mechanical filters was about half that for sand beds. Upon the other hand, taking into account the chemicals used, and capitalising the charges in that respect, the cost worked out pretty much the same with the present high cost of sulphate of alumina at £9 per ton. If the cost of this chemical should fall then the mechanical filters would have the advantage as regarded working charges. But there was one thing to be borne in mind, that mechanical filters gave results in chemical treatment which were superior to those obtained by sand beds, and if a peaty colour had to be removed it was absolutely necessary to put down mechanical filters for that purpose. Mechanical filters also showed greater reliability and were absolutely under control.

Chemists and Income Tax

A JOINT COMMITTEE of the British Association of Chemists, the Institute of Chemistry, and the National Union of Scientific Workers is putting forward the claim that the following expenses should be treated as a charge against income in arriving at the assessment of those who earn their livings either by purely scientific pursuits or by the application of science to industry:—

1. Subscriptions to scientific and technical societies, libraries, and periodicals.
2. Purchase and renewal of scientific and technical books, instruments, apparatus, chemicals and other materials.
3. Rent and expenses of laboratory or study.
4. Travelling and other expenses incurred in attending scientific meetings or congresses.
5. Provision of special clothing and renewal of clothes damaged in the course of employment.
6. Other expenses incurred in the course of research.

The general secretary of the British Association of Chemists would be glad to have information with regard to special cases in which any of the above have been definitely allowed or refused. Replies should be addressed to "Bedford House," York Place, W.1.

A strong deputation has been formed to approach the Income Tax authorities on the subject.

While sympathising with the bad luck of our colleague, Major C. C. Turner, in the attempt to fly from Cairo to the Cape, we are gratified to learn that when the Handley-Page machine in which he was flying crashed near Sherek, all the occupants escaped uninjured. Major Turner, who was acting as aeronautical representative of the *Daily Telegraph*, is the editor of *Aeronautics*, one of Benn Brothers publications, and has a distinguished flying record. On the eve of his departure he was entertained by the firm and his colleagues at a luncheon at the Waldorf. Mr. Ernest Benn, the managing director, who presided, offered Major Turner the congratulations of the directors and the staff on his fine adventure, and their best wishes for a successful flight and a safe return.

Research in the Cellulose Industry

Mr. Cross's Lectures at the Royal Society of Arts

ON Monday evening, at the Royal Society of Arts, Mr. C. F. Cross, B.Sc., F.R.S., delivered the third of a series of lectures on "Recent Researches in the Cellulose Industry."

In the second lecture, on Monday, February 23, Mr. Cross reviewed the leading staple cellulose industries—spinning, wood working and paper making—and modern developments based on chemical modifications and synthetic derivatives of the "natural" raw materials. In the spinning industries, he pointed out, the applications of modern science to progressive perfection of the arts involved an exhaustive study of all the factors of structural and chemical properties of the fibres and fibre substances. The audience was reminded of the work of Dr. W. L. Balls (Fine Spinners Association), as expounded by himself in recent lectures (R.S. Arts, 1919), and later researches on the minute histology of the cotton fibre ("Proc." R.S., v. 90, 1919). In describing the chemical industrial developments of cellulose Mr. Cross dealt with the viscose process and its products—artificial silk, cellulosic films, decorated leathers and new paper-making processes based on a controlled hydration of the cellulose by chemical treatment. Mention was made of the products manufactured by the British Cellulose Co., of Derby and London. Their cellulose acetate, long known in one form of aeroplane varnish (dope), now appeared as transparent film or sheet, and as an artificial silk, of which specimens were shown. An interesting development was that of twisted pulp—or rather paper yarns; and the fabrics of the Cellulose Manufacturing Co. were exhibited as evidence of the many-sided potentialities of the cellulose industries. The use of viscose goods, which had been submitted to the severest tests, was passing gradually from fancy to utilitarian purposes.

Dealing with the twisted paper yarn industry, Mr. Cross said that this was originally a Japanese industry; but when wood pulp was developed in Germany it was thought quite possible that a twisted paper strip would make a very respectable yarn, and a material suitable for a number of the lower uses to which textiles were put. During the war they were further developed, and the Germans and Austrians made up twisted paper into fabrics of all kinds.

Recent Research and Experiments

In his third and final lecture on Monday evening, Mr. Cross put forward the hypothesis that cellulose was really a liquid system, and that its characteristic properties were those of a polar and amphoteric system of which the constitutional components were bodies of extremely small dimensions. There had been a gradual accumulation of facts which tended to confirm this idea. Lately a Lancashire firm had sent him a section of an unbleached cotton rope which had been used for driving in a spinning mill with no chemical fumes near. An extraordinary transformation had taken place in the centre of the rope, which had been transformed into a mass of rounded and symmetrical pellets of cellulose. There was no evidence of great heat in other parts of the rope, but the centre of it had been changed into definitely structural colloidal cellulose. It looked like a physical transformation, and the experiment had been twice repeated. Two new ropes had been put up, and the same results were obtained.

The lecturer said that during the past few years he had been following up observations on the somewhat intricate subject of specific volume. This was a subject surrounded by a great deal of experimental difficulty, but a preliminary attack had been made by himself and a friend, and results had been obtained which showed that in the presence of media which would ordinarily be considered inert and having no connection with water, alcohol and hydrocarbon, the cellulose and cellulose derivatives all showed very remarkable changes in dimensions which were of the order of liquid carbon compound, and although he was not in a position to show the whole of the research, as it had not yet been published, he could show two diagrams which represented successive observations during two months over a range of temperature from 20°C. to 90°C., carried out on what he called purified cotton—i.e., cotton deprived of its chief non-cellulose impurities—as compared with normal cellulose, or calico printers' bleached cellulose. These forms of cellulose had been observed in the presence of water, on the one hand, and of hydrocarbon, on the other, and those who were accustomed to interpret physical changes of this order would see that here we had the fundamental fact that in the volume changes of temperature there were changes of the order of organic liquid expansion, and that the difference of apparent volume of cellulose in water and in hydrocarbon reached the extraordinary range of 15 per cent. variation.

How was that to be accounted for? The only way to account for it was by the assumption that these systems were liquid systems, and that they were penetrated by water just as we knew the paper maker—when he took his pulp and beat it in water—was beating the water system into the cellulose system, and was able to do it because both were liquids, and he was simply breaking down the surface resistance of the cellulose progressively. In the case of cellulose and water there was considerable penetration, but in the case of hydrocarbon, on the other hand, there was reason to believe that there we got more truly to the measurement of the actual volume measured by an external limiting surface, external to the liquid which wetted it.

New Issues in Chemical Industry

British Cellulose Company

THE British Cellulose & Chemical Manufacturing (Parent) Co., Ltd., this week offered for subscription 4,250,000 $\frac{7}{8}$ per cent. Cumulative Participating Preference Shares of £1 each at par, 1,450,000 of which were taken by the Government in payment of their advances to the company for a like amount. In consideration of their purchase of the preference shares the Government have appointed two directors to the board of the company, and the auditors will be to their approval. On the completion of this issue there will be no debentures outstanding and none can be issued, nor can this issue be increased without the consent of the Government. The following are the directors of the company: Sir Harry D. McGowan, Chairman and Managing Director Explosives Trades, Ltd., Managing Director Nobel's Explosives Co., Ltd. (Chairman), Brig-Gen. William Alexander and Sir Philip G. Henriques, appointed by the Government; Sir John Field Beale, Chairman, Interallied Trade & Banking Corporation, Ltd.; Sir Henry Birchenough, Director British Dyestuffs Corporation, Ltd.; Arthur Chamberlain, Chairman, Kynoch, Ltd.; Alexander Clavel, Swiss nationality, Managing Director Société de Teinture et d'Apprêt, Basle; Sir Trevor Dawson, Commander R.N., Vice-Chairman and Managing Director Vickers, Ltd.; Dr. Camille Dreyfus, Swiss nationality; Dr. Henry Dreyfus, Swiss nationality.

In a letter to Messrs. Dunn, Fisher & Co., the bankers of the company, Sir Harry McGowan, on behalf of the board, states: "The company was formed in March, 1918, with the object of acquiring the whole of the Share Capital of the British Cellulose & Chemical Manufacturing Co., Ltd., the operating company, which was incorporated in March, 1916. Arrangements have been made by which the operating company will be immediately liquidated, and the company will then own the actual physical assets instead of, as now, the entire share capital of the operating company, and the word 'Parent' will then be left out of the company's name.

"The Government, having regard to the importance of the manufacture of cellulose acetate, of which this company is by far the greatest maker in this country, and to the future of the company, has made an agreement with the company by which the Government converts its advances, amounting to £1,450,000, and secured by debentures, into £1,450,000 Preference shares of this issue.

"The company owns the rights throughout the British Empire (except Canada) in various secret processes and patents, and erected its plant, which is the only one of its kind in the British Empire, during the war to meet an essential war need. This task was successfully accomplished; over £2,000,000 worth of non-inflammable waterproof material for aeroplanes and airships having been supplied to the Government. The only non-inflammable waterproof covering for aeroplanes and airships is made from cellulose acetate, and it has now been demonstrated that this material has infinite further possibilities. It is the basis for non-inflammable celluloid and non-inflammable films for cinema or photography, and from it can be manufactured a very fine artificial silk, and it can be adapted to many other uses, such as a substitute for glass, &c. The company also are to-day the largest producers of calcium carbide and aspirin in the United Kingdom.

"A silk plant has been established at the works, and has been in operation for some months past, producing artificial silk successfully. After consideration, the directors have decided, in view of the world shortage of textile fabrics, the large contracts they have been able to make for the sale of the product, and the favourable reports received from manufacturers as to the quality of silk fabrics made from their product, that the quickest and most profitable returns will be obtained from developing this side of the business in the first instance. The instalment of plant having an output of 3 tons of artificial silk a day is expected to begin immediately, and orders will forthwith be placed for additional plant which, by the end of the year, will raise the production of artificial silk to a total of 9 tons a day.

"The proceeds of this issue will be used to discharge bank overdrafts and trade liabilities, and to provide the cost of the new plant, leaving a surplus for working capital of about £450,000.

"The Board have exact knowledge of the cost of manufacture of cellulose acetate in bulk (having manufactured over 3,000,000 lb.), and the plant already installed for the manufacture of silk enables them to estimate closely the cost of this further operation. With this knowledge, and taking a conservative view of the selling prices likely to be realised, they estimate that a full year's operation of the plant to be installed for the production of 9 tons of silk per day should yield a surplus of more than 1½ million pounds sterling after providing for adequate depreciation, Excess Profits Duty at the current rate, and the $\frac{7}{8}$ per cent. dividend on the preference shares, or enough to provide an additional dividend of 9 per cent. on these shares.

"The works are situated near Derby, and cover about 200 out of the 340 acres owned by the company. The land, buildings and plant have cost over £3,100,000, the greater part of which was expended before the recent great rise in values was experienced. The additional plant and the working capital to be provided out of the proceeds of this issue will bring the total value of assets up to £4,860,000, apart from the secret processes and patents and without

allowing anything for goodwill or the enhanced value of the buildings and existing machinery at to-day's prices."

It was announced on Thursday that the issue had been oversubscribed.

Lever Brothers

Lever Brothers, Ltd., Port Sunlight, Cheshire, this week offer for subscription an issue of 4,000,000 7 per cent. Cumulative C Preference shares of £1 each at par, payable as follows: 1s. per share on application, 19s. per share on April 15. The present company, which was formed in 1894, has an authorised capital of £100,000,000, of which £25,916,943. 5s. has been issued in various classes of shares. In addition to its business at Port Sunlight the company holds interests in over 90 Associated Companies with numerous branches or selling agencies throughout the world. The present issue is made in order to provide part of the cash payable in respect of the purchase of all the Ordinary Shares in the Niger Co., Ltd., which Lever Brothers have recently agreed to purchase.

Brunner Mond and Electro Bleach

Electro Bleach & By-Products, Ltd., Middlewich, Cheshire, announce that the directors have received an offer from Brunner, Mond & Co. to purchase from the shareholders individually all the Preference and Ordinary Shares in the company by allotment of shares and payment of cash as follows: For every two Electro Bleach Preference Shares one Brunner Mond Ordinary Share and 8s.; for every two Electro Bleach Ordinary Shares one Brunner Mond Ordinary Share and 3s. Odd shares will be purchased for cash at the following prices, namely: For every odd Preference Share, 25s.; for every odd Ordinary Share, 22s. 6d.

The sale of the Electro Bleach shares on the above basis will be ex the final dividend for the year 1919, that is to say, such dividend will be paid to the Electro Bleach shareholders. It has been agreed that the annual meeting of the Electro Bleach Co. shall be postponed pending a decision on the proposed exchange and should the exchange be accepted the directors will recommend final dividends, making with the interim dividends already paid, 7 per cent. on the Preference shares and 14 per cent. on the Ordinary shares for the year 1919. The Brunner Mond shares exchanged as above will be entitled to the same dividends as the existing Brunner Mond Ordinary shares as from January 1, 1920.

The directors are of opinion that this offer is favourable to the shareholders of their company and strongly recommend its acceptance. They have agreed to it in respect of their own shares, and believe that considerable commercial and scientific benefits will result from the co-operation of the two companies. Mr. Fred Scott, auditor of the company, has advised that the offer is one which they can thoroughly recommend to the shareholders.

Brunner, Mond & Co., Ltd., have reserved the right to withdraw the offer unless the holders of at least 75 per cent. of each class of the Electro Bleach shares accept within four weeks from February 25, 1920.

Rainham Chemical Works Explosion

On Monday the Court of Appeal, consisting of the Master of the Rolls and Lords Justices Atkin and Younger delivered their reserved judgment in the appeal by the Rainham Chemical Works and Samuel J. Feldman and Robert W. Partridge, governing directors of the company, from a judgment of Lord Justice Scrutton holding them liable to adjoining owners for damage done by an explosion which occurred at the works towards the end of 1916.

The Master of the Rolls said Feldman and Partridge agreed to find money for the development of a Swiss invention for making picric acid out of D.N.P. They made a contract with the Ministry of Munitions for the manufacture of picric acid and took a lease of the premises in which the company afterwards formed began operations. They were governing directors of the company with absolute security of permanent power.

Before the war D.N.P. was used in dyeing and it was not supposed to be dangerous. It was brought on to the works and kept in barrels. Fire broke out in a room where D.N.P. was stored, and the excess of oxygen in nitrate of soda which was ground, dried and stored, caused the D.N.P. to be subjected to fierce heat. The D.N.P. expanded and a violent explosion occurred.

Persons who brought a dangerous substance on to premises did so at their own risk, and Feldman and Partridge were in the position of directors, who personally authorised the creation of a nuisance by servants of the company. Therefore, they were personally liable and the appeal must be dismissed.

Lord Justice Atkin concurred.

Lord Justice Younger thought that Feldman and Partridge had no greater liability than would have had the directors of any public company, and that the appeal should be allowed.

By a majority the appeal was dismissed with costs.

DOMINION STEEL.—The usual quarterly dividend of 1½ per cent. has been declared, payable April 1.

The Corrosion of Metals

Paper by Dr. G. H. Barley

At a special meeting of the Edinburgh and East of Scotland Sections of the Society of Chemical Industry, held in the Cockburn Hotel, Edinburgh, on Friday, February 27, Dr. G. H. Barley, of the Kinlochleven Aluminium Works, read a Paper on "The Corrosion of Metals." Dr. D. S. Jerdan presided.

Dr. Barley's object was to place before his hearers the knowledge he had gained regarding the corrosion of metals—aluminium in particular—as the result of eleven years' observation, and to explain his method of diagnosis. After referring to the usual unsatisfactory procedure adopted, he said that the first step that was necessary was to know what they were dealing with and what factors were likely to arise. They must know what the metal was and what its composition was with regard to impurities, how it was produced, whether cast metal or old metal or whether annealed and so on.

It was not much good trying experiments with liquid reagents of various types in order to reproduce the changes which corrosion brought about, unless some note was taken of the definite experiments made with regard to the concentration of that liquid and with regard to the sufficient supply of that liquid, so that they had as nearly as possible constant conditions for the attack. The acid might become very much reduced in its activity. They had to take into account the time given to the experiment and be sure there was not much alteration in the conditions during its course. They wanted the action they desired to study to be nearly constant during the whole of the period, and therefore they had to use and keep a large excess of the reagent. Another important point was the question of the air supply. In the case of aluminium they might put it into a highly corrosive reagent, and get no action at all, provided they had taken care to remove the whole of the oxygen dissolved in that reaction. There was the preparation of the metal, so that when it was exposed to the liquid it must be in a condition comparable with similar other metals. Temperature was a very potent agent. Usually a rise of 10°C. in the temperature of the reagent would about double the activity of that reagent. He was speaking in general terms, but it applied in many cases. Then there was the effect of ionisation—the effect of the formation of by-products, some of which produced solid bodies that deposited on the metal, and would interfere with the attack on the liquid. The matter was simplified on account of the minor effect produced by some of the elements he had mentioned. It was only by conducting a series of experiments on the lines of elimination that they discovered which effects had large and which had small action.

Quantitative Effects of Corrosion

In order to ascertain the corrosive effect from a weak solution of hydrochloric acid, ammonia or carbonate of soda, they took a plate of aluminium of any dimensions; the reagent was stirred from time to time quite enough to keep it oxygenated. The effect was very often a large decrease of water. The flow of water was a special question which they could examine by special experiments. If there were no oxygen dissolved in the reagent in many cases they got no action whatever taking place. If he took a sheet of aluminium properly prepared and the surface measured, he would weigh it, and the weight of the metal would be represented by a large W ; he would place it in the liquid, and expose it in the liquid for a sufficient time to try such conclusions as were necessary—it might be 12 or 24 hours, it depended on various things. On taking it out of the liquid, and if there was no deposit on it which could be removed by the finger rubbing away any loose material off the surface, he would return it to the liquid. Then he would take out the plate, put it on a hot plate, where it would be heated to about two or three hundred, sufficient to dry the metal. Then he would weigh the metal again, and a small w would represent its weight after being exposed to the liquid. Presuming that action had taken place small w would be less than large W . If action had taken place there would be the loss of the deposit that had been rubbed off, and there was the liquid which contained some of the metal in solution, and they could now determine the amount of the metal in the solution by precipitation. That, in the case of aluminium, would be illumina. Having weighed it as illumina they could calculate it into aluminium again. As aluminium to alumina was almost exactly as 0.9 to 0.17, represented by S , it gave the amount of aluminium gone into solution so near that it would complicate any experiment to attempt to take decimals in the matter, and if he took $9/17$ ths of the weight it gave the amount of aluminium that had gone into solution.

Therefore, unless something had happened that they had no idea of, if they added the small w plus $9/17$ S they would find it equal to big W , which ought to be the original weight taken. But usually there was a deposit formed, and the earlier experimenters tried means to estimate that deposit by dissolving it with water. It was absurd to think they could dissolve a deposit and weigh it, and the method he suggested was to ascertain how much the deposit amounted to in this way, that if there was no deposit on the metal that equation was true, and if there was a deposit the equation was not true, and in that case when they came to add these two together they found they did not equal, but were smaller, and they were smaller by the amount of

oxygen contained in the alumina of the deposit. He assumed for the moment that the deposit was alumina. The deposit of that metal was always alumina, together with a portion of iron oxide and silica, which was negligible. The relation of iron to its oxide and silica to its oxide was not very far apart from aluminium to its oxide. If, therefore, he found W was greater than w plus $9/17$ S , it was due to the fact that the deposit was not metal, but was oxide, and, therefore, the difference between these two made the weight of the oxide that formed the film. That was one step which was important to the other, and enabled one to determine with enormous exactitude. It was quite allowable to talk about films of a millionth of a millimetre as being actually measurable. Aluminium 54, oxygen 48 was 9 to 8 for an eighth part of oxygen combined with nine parts of aluminium. Therefore, $9/8$ ths of that would give them the alumina that was contained in that deposit, and if they took the amount of the solution and added it to this expression they got a record of the whole amount of aluminium which had been separated away. The total expression for the metal which had undergone corrosion taken by steps worked out to a very simple expression—

$$\frac{9(S+w, - W)}{8}$$

When they had done this experiment they had got the weight of the alumina precipitated, the weight of the metal in its exposed condition and the weight of the metal before it was exposed; and when they put these together with the necessary signs before them and multiplied by $9/8$ they got the total of the metal that had undergone corrosion. The quantitative effect of corrosion could therefore be measured however they varied their conditions. Solutions with air had no action, and air without water had no action on aluminium that had been exposed to air for a long time, unless it be air that had been saturated with moisture and the two acted together. Aluminium cable was very often a constant metal. But aluminium corroded very rapidly under certain circumstances. If they had a cable so fixed that there was a kink in it, which might happen at a joint, and if water trickled or hung about the cable for days or weeks together, and was dried in the sun and got wet again they would gradually have corrosion taking place, and that corrosion if it happened at the joint, however nominal, would be very slow. But if the cable happened to carry an overload of electricity, and it became heated the action would quicken up very rapidly. Temperature was a very important matter, because if the corrosion became anything like serious in the cable they would have still more rapid corrosion, the cable itself would get so far corrosive that it would lose its carrying power, and itself become a resistant circuit. The heat increased all the time and the carrying power decreased, and the cable might go in a very short time. The effect of concentration and the effect of impurity in the metal were two of the largest factors that had to be dealt with.

Protective Coatings

Dr. Barley then showed by means of a diagram the activity of various reagents, and in certain special cases, and went on to consider the formation, nature and effects of protective coating, and he showed that the amount of protective coating could be very accurately measured. This question of the protection of the metal was certainly a question of protection for its own sake. Aluminium, like any other metal, had its vices. It was wanting in tensile strength for heavy construction. In conclusion, Dr. Barley said the methods he had put before his audience in regard to aluminium could nearly all be employed in iron, copper, lead and other metals. Lead was one of those metals, the bad effects from which would be simply enormous. If used freshly as pipes for drinking water a whole village might be poisoned. But if that lead were left in water for a month they became quite harmless. There again protective coating was being made use of for valuable purposes. He referred to the investigations by Drs. Seligmann and Williams on the action of nitric acid and fatty acids and alcohols and organic bodies, and to the report published last year by Dr. Bengough on the question of corrosion.

A discussion followed, to which Mr. Williamson, Professor Walker, Mr. Norman Kemp, Mr. Watt, and Dr. Hendrick contributed.

IN A LECTURE ON "The Opening of New Territories in Papua" before the Royal Geographical Society on Monday, Lieut. F. W. Pearson Chinnery said that what little development there had been in New Guinea was of great promise. Gold, osmium and valuable oils had been discovered in the interior; the mangrove swamps of the western coast-line were rich in tannin; indigenous fibres abound everywhere; and there could be little doubt that organised investigation would disclose many other valuable assets.

THE SHEFFIELD ASSOCIATION OF METALLURGISTS AND METALLURGICAL CHEMISTS have decided to hold a ladies' night at the Royal Victoria Hotel, on Friday, March 26, at 7.30 p.m. Many of the leading artists of the town have promised their assistance, and it is hoped there will be a good attendance of members and their ladies. Each member is entitled to two tickets, but as the accommodation is limited, the association is only able to issue 150 tickets, and these will be sent out in order of application.

British Cellulose & C.M. Co. Questions to Ministers in Parliament

In the House of Commons on Monday Mr. Kiley asked the Minister of Munitions whether he had agreed to cancel debenture and other charges amounting to £1,950,000 which the Department held on the assets and uncalled capital of the British Cellulose Manufacturing Co., Ltd., accepting in lieu profit-sharing preference shares to the value of £1,450,000; could he state whether the Government had nominated two directors of this company; whether these two directors were to devote all their time to the duties of the company; whether they were to receive a salary from the Government; if so, to what amount; and could he state the value of cash on shares to be received by the vendors or promoters?

Mr. Hope: It is not correct to suggest that the debentures and other charges on the assets of the British Cellulose & Chemical Manufacturing Co., Ltd., amounting to £1,950,000 are held by the Ministry of Munitions solely in its own right. Of this £1,950,000 the Ministry holds the sum of £700,000 as trustee for other parties; but, in addition, the Ministry holds a further charge of £200,000. The Ministry holds, therefore, on its own behalf, the sum of £1,450,000, and in lieu of this the Government has agreed to accept 1,450,000 7½ per cent. cumulative participating shares of £1 each. At the same time the Government reserves the right to veto the creation of any debentures or other charges which might rank in priority to or *pari passu* with their shares. The Government has appointed two directors to sit on the board of this company; but those directors will not devote the whole of their time to the duties of the company. The ordinary remuneration received by these directors from the company will be paid into the Exchequer, and they will receive remuneration from the Government in the same way as other directors appointed by Government Departments. The amount of such remuneration is now under consideration. The issue of preference shares to the public is for the purposes of enabling the company to discharge its liabilities and to provide the cost of new plant and the necessary working capital. The whole of the amount received for these shares less the usual expenses of issue will, therefore, be received by the company for these purposes.

Effect of Government Investment

Mr. Kiley asked whether, by the appointment of the directors to the British Cellulose Manufacturing Co., Ltd., the Government were taking any responsibility to the investors who might invest their capital on the knowledge that Government representatives were on the board; whether he was aware that this company proposed to manufacture artificial silk and other commodities in competition with other old-established firms; were the Government prepared to advance capital and appoint directors to the boards of other such competitive firms; and, if not, why not?

Mr. Hope: The answer to the first part of the question is in the negative, and to the second part of the question the answer is in the affirmative; but the Government is only concerned with policy of the company in so far as it affects their own security. As to the remainder of the question, the Government advanced money to the British Cellulose & Chemical Manufacturing Co., Ltd., during the war, solely for the purpose of ensuring an adequate supply of certain materials which were vitally necessary for war purposes. This money was secured by debentures and other charges. The Government has now consented to take 7½ per cent. cumulative participating preference shares in the company in lieu of their debentures and other charges, and has appointed two directors to sit on the board as a matter of ordinary business prudence. The object of this arrangement is to ensure that the advances previously made by the Government are secured in the manner thought to be most desirable. It is not the practice of the Government to advance capital to trading companies for the purpose only of enabling such companies to develop their ordinary business, and the Government therefore are not prepared to make such advances either to this or similar companies.

Scheme Approved by Ministry of Munitions

Mr. Cautley asked the Chancellor of the Exchequer (House of Commons, March 2) (1) the reasons why he had approved of the Government taking 1,450,000 of the British Cellulose Co.'s preference shares rather than insist upon the company's property being sold and the Government's investment therein, made during the war, repaid; what justification the Government had for taking part in the industry of film producing; (2) under what circumstances the Government became financially interested in the British Cellulose Co., Ltd., and to what extent and upon what terms?

Mr. Chamberlain: Under agreements made during the war with the British Cellulose Co. for the production of acetate of cellulose, the Ministry of Munitions contracted to advance to the company a proportion of its expenditure on plant and buildings for the purpose. Towards the end of 1919 arrangements were made to secure these advances, amounting to £1,250,000 in addition to a loan of £200,000, on the security of the company's power plant, by debentures on the understanding that the company would make an issue of preference shares in order to provide itself with the necessary working capital for the development of its peace business.

Experience has shown, however, that in these circumstances it would not be possible for the company to raise the necessary funds to continue its undertaking, and accordingly, after very careful consideration and as part of a scheme for the reconstruction of the company, I approved the proposal of the Minister of Munitions to take 1,450,000 7½ per cent. accumulative participating preference shares in place of the existing mortgage and debentures. It is a condition of this arrangement that in case of war the Government shall have the right to take control of the management of the factory for the purpose of producing munitions, and that the company unreservedly abandons certain large claims put forward by them in connection with their transactions with the Government during the war.

Mr. Cautley: Is the right hon. gentleman aware that the fact that two Government directors applied for 1,450,000 shares is being used by the company as a means of inducing other people to take shares?

Mr. Chamberlain: We took the shares in view of our prior lien charge. We believe that will be in the interests of the country both as a creditor of the company and because it will facilitate the establishment of this industry here.

Mr. G. Lambert: Has not this company made large profits during the war, and could the right hon. gentleman not consider the possibility of the company paying off its liabilities to the Government?

Mr. Chamberlain: We considered that, and we found it was not possible for the Government to do it.

Mr. France: What as to the profits of the company?

Mr. Chamberlain: I inquired as to the profits of the company, and satisfied myself that it was not possible for the company to pay off our debentures or to raise capital with our debentures as a prior charge.

The Position of Courtaulds

Mr. Alfred T. Davies had on the Order Paper of the House of Commons on Wednesday the following two questions to the President of the Board of Trade: (1) Whether Messrs. Courtaulds have any interest or shares in the British Cellulose & Chemical Manufacturing Co., Ltd., and if he will say by whom and for whom are the 2,800,000 7½ per cent. preference shares recently issued underwritten; (2) Whether he will see that, so far as the manufacture of artificial silk is concerned, the British Cellulose & Chemical Manufacturing Co., Ltd., shall work independently of any combine; whether he can give any indication as to when the company will be in a position to supply artificial silk to users of the same; and, in view of the fact that the company has been and is still financed by the Government, will this article be sold at a price showing a reasonable profit only.

In a reply to both questions Mr. Hope, Financial Secretary, Ministry of Munitions, said: The Government are shareholders in this company, and can only exercise a limited control over the general policy of the company through their voting powers and the powers conferred on the two Government directors. I have no information as to who are the other shareholders, or as to when the company will be in a position to supply artificial silk. The issue of preference shares has been underwritten by Messrs. Dunn, Fisher & Co., 41, Threadneedle Street, E.C.2.

Mr. W. B. Hardy on Lubrication

On Friday evening, February 27, at the Royal Institution of Great Britain, Mr. W. B. Hardy, F.R.S., delivered a lecture on "Problems of Lubrication."

Mr. Hardy opened his lecture with a simple experiment. Taking an ordinary china cup and saucer, and tilting the saucer slightly, he showed that the cup slid off, but by wetting them with water the two surfaces tended to stick together, and the cup did not slip until the saucer was tilted to a much greater angle. The first explanation was that the particular force known as capillarity was at work. This force Mr. Hardy illustrated by two experiments. The first consisted of placing a vertical capillary tube in liquid, and it was seen that some of the liquid was drawn up the tube. The second showed that the hairs of an ordinary camel-hair brush, when dry, were separate, but after being dipped in water they clung together. Mr. Hardy explained that, but for the fact that the walls of the tube were rigid, this same force would draw them together.

The first experiments were here carried out in a different form. Taking a plane of glass and an ordinary glass bottle with approximately dry surfaces, and wetting the bottom half of the plane, the bottle was seen to slip easily over the dry part, but when it reached the wet surface its progress was arrested. On ebony the result was the reverse. The bottle would not slip on the dry part, but when it was placed on the wet surface it slipped readily. A yet different result was obtained with another substance, which the lecturer did not name. On this the bottle slipped easily, whether the surface was wet or dry.

These results the lecturer described as remarkable, and it seemed to him that they brought us to the very heart of the question of lubrication. The action of the air on the surfaces was the real difficulty. On any glass face there was present a layer of lubricant,

which was due, probably mainly, to the atmosphere. To illustrate this, Mr. Hardy described some further experiments. A plane of glass was cleaned by washing with soap and water, and dried in the air, and a clean glass bottle placed on it, and a fair angle was given before the bottle slipped. If the face were really clean the bottle would not slip at all, but would seize. This was due to the condition of the air. The air contained both solid particles and grease, and Mr. Hardy demonstrated two methods of purifying it, first by burning with a bunsen burner, and secondly, by passing it through cotton wool. The latter method was discovered by Paston.

This lubrication action, which made the bottle slide, was completed when there was a layer of lubricant on the glass little more than a molecule thick. A photograph was exhibited showing the track of a watch glass, weighted with lead, sliding over another piece of glass. The scratching was made up of pits and plates, nearly alternate, torn off the surface of the glass. When the faces of glass were placed together in that way, the one tracked from side to side and caused tearing.

Mr. Hardy then summarised the lessons these experiments had taught us. First, that lubrication was completed by an extremely thin film of fluid; in the second place, that lubrication was not the constant property of fluid; and, thirdly, that if there were no lubricant at all the cohesion operated between the opposing faces, and the friction resistance was really not the interlocking of the inequalities of the two faces, but the actual cohesion operating across from one solid face to the other. The work of experimenting with glass was very arduous owing to its sensitiveness, and Mr. Hardy had tried bismuth and bismuth sliders. Bismuth could be cleaned by polishing it hard with washleather. He had examined 100 different chemical substances, both fluids and solids, in order to determine how they acted as lubricants on bismuth.

In conclusion, Mr. Hardy said that he had hoped to carry out more experiments, but unfortunately the London air had defeated him.

Dyeing with Vat Colours

MESSRS. BROTHERTON & CO., LTD., of Leeds, have in preparation a series of booklets dealing with sodium hydrosulphite (hydros), the first of which, "Vat Dyeing," is about to be issued. The booklet, of which we have received an advance copy, is attractively printed, and copies will be supplied to readers of THE CHEMICAL AGE who are interested in the subject and make application to the firm.

The use of hydrosulphite for dyeing indigo (it is pointed out) was introduced in the early seventies by Schutzenberger and Lalande, and its adoption by English wool-dyers was fairly general. As a consequence of this extended use of hydrosulphite in England, the hydrosulphite vat is generally known on the Continent as the "English vat"; and Continental manufacturers of hydrosulphite cited the English experience in introducing their product all over the world.

This use of hydrosulphite was attained in spite of the disadvantage of using hydrosulphite of soda in the form of solution. Hydrosulphite solution is unstable; and, whether it was prepared in the dyehouse or purchased ready made, it was very difficult, if not impossible, to know the exact strength without testing it immediately before use. Under these circumstances the dyer could not tell how much hydrosulphite should be used to reduce a given quantity of indigo in his vat, and unreliable results were obtained. This disadvantage is entirely removed by the use of solid hydrosulphite of a standard composition, such as the hydros of Messrs. Brotherton & Co., Ltd.

There is a fundamental difference between the use of hydrosulphite for reducing a vat colour and the use of the other reducing agents employed for this purpose. Hydros is completely soluble in the vat. Thus, the solution itself reduces, and each particle of colour is surrounded by the reducing medium, whilst in the zinc dust or lime vat, or iron-vitriollime vat, the reducing agent is in the solid precipitate, and acts only upon the solid indigo with which it comes into contact. The action of hydros is consequently much more rapid; so that the hydrosulphite vat is again ready for use much sooner than one prepared, for instance, with zinc dust and lime. This advantage is obtained not merely on starting the vat, but also every time the vat is freshened up by the addition of further reducing agent, with or without the addition of indigo or other vat colour.

The use of hydros ensures that the vat is kept clear and free from sediment. This makes continuous use possible; whereas methods which entail the production of sediment must result in an intermittent process from the frequent need for clearing the vat.

Further, even when used in excess, hydros does not produce the so-called "over-reduction" of indigo which results in the loss of some of the indigo employed.

When using hydros the loss of indigo in the vat is not more than 1 to 2 per cent., and is frequently less than $\frac{1}{2}$ per cent.

These figures should be compared with the losses found to be incurred when working under normal conditions with the other indigo vats. They are as follows:—

In the iron-vitriol vat, 20 to 25 per cent.; in the zinc-lime vat, about 10 per cent.; in the bisulphite vat, 5 to 20 per cent. according to the temperature and to the time that the vat stands.

The fact that in the hydrosulphite vat the whole bulk of solution is permeated by the reducing agent, makes one well-known precaution necessary. The goods should be thoroughly squeezed on leaving the vat so that the solution containing the reducing agent and the indigo white is squeezed out of them. The omission of this precaution may result in uneven dyeing, especially in the case of woollen goods, for the solution of indigo white remains in the fibre, and afterwards oxidises, staining the goods unevenly. In vats that contain the reducing agent in the sediment this precaution is not so necessary.

Society of Public Analysts

At the ordinary meeting on Wednesday at the Chemical Society's Rooms, Burlington House (Mr. Alfred Smetham, president, in the chair), a certificate was read for the first time in favour of Mr. Laurence Harry Mills, B.Sc. (Birmingham), A.I.C. Certificates were read for the second time in favour of Messrs. Henry Atlas, John Carmichael, F.I.C., Herbert John Evans, B.Sc., F.I.C., Cornelius Durham Garbutt, Douglas Henville, F.I.C., Maurice S. Hutchinson, B.Sc., Benjamin Richards James, F.I.C., Geoffrey Martin, D.Sc., Ph.D., F.I.C., Robert Leitch Morris, F.I.C., James Wood, M.A., B.Sc., F.I.C.

Mr. William John Read, B.Sc., F.I.C., was elected a member of the Society.

Papers

In a Paper on "The Detection of Finger-Prints on Documents," Mr. C. A. Mitchell pointed out the persistence of finger-prints, to illustrate which he produced specimens 56 years' old. He discussed various methods of detecting finger-prints on documents, by means of mechanical methods, dyes, ink, chemical reagents, iodine vapour, &c., and concluded with a full bibliography of the subject.

Mr. T. J. Ward next contributed a Paper on "Photomicrography with Simple Apparatus." In this he gave some simple methods for the production of low-power photomicrographs, together with a demonstration of his apparatus for magnifications not exceeding X40, and descriptions of methods of illuminations employed. Lantern slides were exhibited illustrating results obtained.

The third Paper, by Mr. R. V. Wadsworth, gave results of tests carried out by him on the solubility of theobromine in most of the commoner solvents. The figures obtained were compared with those given by a number of authorities, and the difference was found to be very great in some cases.

Technical Education

In his presidential address to the Association of Technical Institutions on Friday, February 27, the Marquis of Crewe, dealing with the question of the development of closer relations between scientific and practical training, referred to American efforts in this direction. One experiment was a co-operative industrial course of four years duration, in which students worked in pairs, each taking half time at a factory or engineering shop and the other half at the school. It was said that employers did not find that the work suffered in comparison with that of a single worker. Another American plan was for groups of students to visit selected factories or works willing to receive them. The students stayed for several weeks, and were individually initiated in all the different industrial processes, as well as, in some cases, business management.

At a more advanced stage came the research fellowships, originally instituted at Kansas University and Pittsburg College, and which, he was glad to think, were finding parallels in this country. The principle was that, when a manufacturer desired some special research made, he applied to the institution for the services of a post-graduate worker, who carried it out with the necessary assistants, often at the college laboratory, but often at one specially arranged for the purpose at the works. The manufacturer contributed on a fixed scale to the cost of the experiments, and, if valuable results were achieved, the proportion of gain was allocated to the different parties by an independent authority. This solved for the particular parties the problem which had long haunted all those concerned with the endowment of research—what reward the researcher should receive as compared with the capitalist, without whose aid the discovery might never have been made, and who—in some cases in this country, at any rate—if rumour spoke truly, had felt justified in practically appropriating the whole.

We could not shut our eyes to the fact that these admirable and praiseworthy advances were to a great extent made possible by the existence in the United States of university and collegiate endowments on a scale for which no parallel could be found in Europe.

Recent Wills

Mr. J. J. Hadfield, of Derby, the owner of bleach works...	£26,997
Lord Rayleigh, of Terling Place, Witham, Essex (net	
personalty, £172,245)	£172,972

Chemical Matters in Parliament

Dyestuffs Investigation Committee

In reply to Major Barnes (House of Commons, March 1), Mr. Bridgeman stated that the Standing Committee on Trusts of the Central Committee under the Profiteering Act propose to appoint a Sub-Committee to investigate dyestuffs with the following terms of reference: "To investigate the position with regard to dyestuffs and to ascertain whether any trust or trade combination exists, and if so, its effect on supplies and prices." The Standing Committee on Trusts propose that the following members of the Central Committee should be invited to serve on the sub-committee: Mr. Ben Turner, Mr. A. W. Flux, Mr. Arthur Greenwood, Mr. John Hilton and Mr. T. B. Johnston; and the Board of Trade propose to invite Major Barnes and Sir Alexander King to serve on the sub-committee. It is hoped that the Committee will meet at an early date.

Importation of Potash

Sir Richard Cooper asked the President of the Board of Trade (House of Commons, March 1), if one or more representatives of his department, or of any other Government Departments, had been sent to any place on the Continent since the armistice to negotiate for the importation into the United Kingdom of German potash; was this emissary or emissaries empowered to arrange the terms of such importation; and what were the names of such representatives and their nationality at the time of their birth?

Mr. Bridgeman: Two representatives were sent in March, 1919, to Rotterdam to meet representatives of the German Government to discuss arrangements for the importation of German potash into the United Kingdom in credit for foodstuffs, in pursuance of arrangements made at the Financial Conference held at Treves in the preceding February; and they were empowered to draw up a provisional agreement, subject to the approval of His Majesty's Government, for the purchase and importation of potash. The representatives were Mr. James Francis Ronca of the Board of Trade, and Mr. Arthur Blok of the Potash Production Branch of the Ministry of Munitions; both representatives are British-born subjects.

Sir R. Cooper: What was the total amount of the original contracts for the importation of German potash, arranged by the Board of Trade; what quantities of the various grades, carnallite, kainite, muriate, and sulphate, have so far been received in this country on account of that contract; and what price per ton has been paid to Germany for the various grades of potash so imported.

Mr. Bridgeman circulated the following statement:—

Grades.	Quantities covered by the Contract.	Quantities received in the U.K. to date.	Prices credited to German Government f.a.s. Rotterdam.*
	Tons.	Tons.	£ s. d.
50% muriate of potash.....	20,000	8,288	16 5 1
90-95% muriate of potash ...	5,000	2,300	18 0 8
90% sulphate of potash	13,500	5,970	18 15 11
Potash manure salts (minimum content 30% potash as K ₂ O)	10,000	7,855	8 5 1
Total	48,500	24,413	—

Sale of Victoria Works, Cheshire

Mr. Rose asked the Parliamentary Secretary to the Ministry of Munitions (House of Commons, March 1) whether, in the case of the sale of the Victoria Works, Wincham, Cheshire, for £60,000, due regard was taken by the Disposals Board of the value of the plant; and whether he is aware that the Salt Union, the purchasers of the factory, held a private sale of only a part of the plant and machinery, and realised nearly £60,000?

Mr. Kellaway: Due regard was given in fixing the proportion of the purchase money for the machinery and plant passing with the deal. The £60,000 was not the only consideration for the sale, as the Ministry, in addition, saved liabilities. It is understood that at the recent sale by the Salt Union of the major portion of the plant and machinery only about £22,000 was realised.

Imports from America

Mr. Hartshorn asked the President of the Board of Trade (House of Commons, February 26) if he could state for the year 1919 the nature of the imports into the United Kingdom from the United States of America, divided under the categories used in the monthly trade accounts?

In the reply issued by Sir A. Geddes, chemicals, drugs, dyes and colours valued at £5,925,051 appear in the list of "Articles Wholly or Mainly Manufactured." Sir A. Geddes pointed out that these were uncorrected figures but might be considered approximately correct.

* The amount to be delivered at Rotterdam is approximately two-thirds of the whole. The remainder is to be delivered f.o.b. Hamburg at prices 5s. per ton lower than those set out above.

King's Lynn Chemical Works

Mr. Tootill asked the Minister of Labour (House of Commons, March 3) whether he was aware of the feeling that existed in the town of King's Lynn with regard to the action of the King's Lynn Chemical Works employing girls on work that, previous to the war, was carried out by men; whether he was aware of the number of ex-service men who were seeking employment in this district; and whether he could take any action in the matter.

Mr. Parker, Lord of the Treasury, who replied for Sir R. Horne, said that he was causing inquiries to be made, and as soon as these were completed he would communicate the result to the hon. member.

Mining Royalties in Cornwall

Dr. Addison, in reply to Mr. W. Thorne (House of Commons, February 25), who asked whether metalliferous mines in Cornwall and Devon were rated to the local rates on the royalties annually paid to the landlords; and what approximately was the annual amount paid in royalty by the tin-mining industry of Cornwall and Devon, stated that, subject to various qualifications, the reply to the first part of the question was broadly in the affirmative. With regard to the second part of the question, he was informed that the amount assessed to Mineral Rights Duty in respect of tin mines was £33,420, and no doubt the bulk of this related to Devon and Cornwall.

Bradford Dyers Association

The Chairman on the Dye Situation

MR. M. S. SHARP (chairman), presiding at the twenty-second ordinary general meeting of the company in Bradford last week, said that there had been much criticism on the failure of British dyemakers to meet the requirements of the country, especially in regard to the production of the higher class dyes. Most of those (he said) who have been in the closest daily touch with the problem since that fateful day in August, 1914, when war was thrust upon the world by Germany, have scant sympathy with such criticism. It is a certainty that before the war not 10 per cent. of the aniline dyes used in the United Kingdom were made in this country, and the total weight manufactured would not exceed 2,000 tons a year. We have it on the authority of the *Board of Trade Journal* of February 5, that the production is now 25,000 tons a year, which is more than 20 per cent. in excess of the total weight of aniline dyes consumed in this country in the years immediately before the war, and I think it may be safely said that the progress made by the colour making industry since 1914 has been greater than those having real knowledge of the difficulties and the problems involved would have thought possible. When I look at the value of dyed and printed textiles exported last year in conjunction with the total weight of aniline dyes imported during the same period, it tends to deepen my appreciation of what British dye makers have done during the last 5½ years. The value of our exports of dyed and printed textiles in the period named reached a total of £181,900,350, and the total weight of aniline dyes imported from all sources amounted to only 3,234 tons, of the value of £1,826,574. It must be remembered further that the home consumption of dyed and printed textiles during the same period was certainly greater than at any time in the history of the country. It is true we have not the variety, and that we lack some of the best colours, but, on the other hand, it is beyond question or doubt that in the supply of dyes we in this country are in a much better position than any other country in the world, not excluding Germany, though there is strong evidence that dyes are being hoarded in Germany in the hope of prices rising still higher.

An enormous responsibility, however, still rests upon British dye makers. They know better than it is possible for the general public to know how vitally important it is from the standpoint of national safety that the dye-making industry should be established in this country on a great scale. In some quarters there appears inclination to advocate bounties for British dye makers. In the present position of our national finances I do not think there is any probability of any Government giving heed to such a suggestion. It is true that in the early days of the war your directors most strongly advocated grants in aid to the dye makers, but in my opinion, though it is not shared by all my colleagues, the circumstances have entirely changed. German industry is out and under, and a breathing time is still left to British dye makers in which to firmly establish themselves, and they will be wanting in their duty if they fail to take the utmost advantage of it.

I cannot look with favour on another suggestion for encouraging and protecting British dye makers, that is by means of import duties, as in the light of the latest knowledge there would not appear to be the slightest reason for so doing. For 5½ years, I have been almost constantly engrossed in the dye question, and what I favour is what I believe to be the view of most men, not only in this country, but also in America, who have been in daily contact with the problem during that time, namely, prohibition of import of dyes except under licence, but the licensing authority must be so organised as to be able to act in the promptest way and have unquestionable power to grant licences, not only for any colour which is not made here, but also on account of inferior quality or higher price of the British article.

From Week to Week

THE EXPORT of aluminium, lead, zinc, tin, nickel and copper and alloys from Germany has been prohibited.

SIR A. E. GARROD has been appointed Regius Professor of Medicine in the University of Oxford, in the room of the late Sir William Osler.

PILKINGTON BROTHERS, of St. Helens Glassworks, have presented to the town 3½ acres of land for the purpose of a children's playground.

MR. R. E. GRAVES has been appointed Chief Inspector of Factories, in succession to Sir Malcolm Robinson. Mr. Graves has been Deputy Chief Inspector of Factories since 1912.

IN EIGHTEEN MONTHS, it is stated, the production of Messrs. L. B. Holliday & Co., dye manufacturers, Huddersfield, has developed from 50 tons per month to considerably over 50 tons per week.

THE SENATE of the University of London at its meeting on February 25 instituted a Chair of Radiology at the Middlesex Hospital to commemorate the work and sacrifice of the late Mr. C. R. C. Lyster.

MR. F. M. POTTER, who is associated with the products works of the Gas Light and Coke Co., has been re-elected to the Council of the Institute of Chemistry.

A CORRESPONDENT POINTS OUT that at the annual meeting of the Institute of Chemistry, held in London on Monday last, THE CHEMICAL AGE was referred to no fewer than five times.

MRS. JOSEPH BLAMIRE, a former Mayoress of Huddersfield, has given £2,000 to the Governors of the Huddersfield Technical College to found a scholarship of chemical research in memory of her late husband, Alderman Blamires.

MR. GEORGE COURTAULD, one of the founders of the silk manufacturing firm of Courtauld's, Ltd., and the oldest magistrate in Essex, died at his residence near Halstead, on Monday, at the age of 89. He formerly represented the borough of Malden in Parliament.

INSTRUCTIONS have been prepared by the Clearing Office for the assistance of British creditors in filling up their forms claiming pre-war debts from Germany. Copies may be obtained on application to the Controller, Clearing Office (Enemy Debts), Cornwall House, S.E. 1.

IT WAS ANNOUNCED on Thursday, February 26, that the Council of Chemical Manufacturers have recommended to the employers and union that the men's demands be met by granting national minimum rates of 1s. 5d. per hour for labourers and 1s. 7d. for shiftmen. The decision of both parties is awaited.

VISCOUNT BURNHAM, on the invitation of the Board of Trade, addressed a large audience of manufacturers and members of the wholesale trade on Tuesday at the British Industries Fair at the Crystal Palace on the advantages of organised publicity in connection with international commerce.

IN VIEW of the urgent necessity for an extension of the Cavendish Laboratory, Cambridge University, the Financial Board have recommended as an emergency measure that plans and estimates be obtained for a second storey over the large laboratory and that the erection of the building be proceeded with.

MR. E. H. CAPP, representative of the Federation of British Industries in Italy, who is at present on a visit to Newcastle in order to supply information to local manufacturers and traders respecting openings for British commerce in Italy, states that among the urgent needs of the Italians are chemicals, chemical manures, dyes, paints and varnishes and steel for reinforced concrete.

THE COUNCIL of the Royal Society have recommended for election into the Fellowship of the Society the following 15 from the list of candidates: Dr. E. F. Armstrong, Sir J. C. Bose, Dr. R. Broom, Professor E. P. Cathcart, Mr. A. C. Chapman, Dr. A. P. Chattock, Mr. W. Hill, Dr. C. G. Knott, Professor F. A. Lindemann, Dr. F. H. A. Marshall, Dr. T. R. Merton, Dr. R. C. L. Perkins, Professor H. C. Plummer, Professor R. Robinson and Professor J. W. W. Stephens.

WE LEARN that Mr. Henry H. Markwald has sold his interests in Messrs. Markwald, Son & Abel, and Markwald, Son & Lemon, of Australia, to his former partners, Messrs. Abel, Lemon and M. L. Markwald. These gentlemen propose to form an Australian Company to conduct the businesses under the title of Abel, Lemon & Co. Proprietary, Ltd. In the meantime all the buying for the new concerns is being done by Mr. M. L. Markwald at 317, High Holborn ('Phone, Holborn 1875), his temporary address. Notice of the formation of the new concern and the permanent address will be given in due course.

IT IS ANNOUNCED that Mr. G. H. Roberts, M.P., who has resigned his position as Food Controller, will shortly take up a directorship of Home-Grown Sugar, Ltd. The company has been formed to carry out a scheme which has been approved by the Government whereby the production and sale of beet sugar are to be organised and developed on a large scale. The British Sugar Beet Growers' Society owned an estate at Kelham, in Nottinghamshire, of 5,603 acres, and of this all but 2,769 acres, which have been sold for a land settlement scheme, is being handed over to the new company.

A FIRE OCCURRED on the premises of Messrs. A. W. Penrose & Co., engineers and wholesale chemists, on Tuesday. This firm carries on a large business in preparations for photography and photographic engraving. The fire started in the chemical department, where a bottle of ether was dropped and smashed, and the fumes from the ether were ignited by the flame of a gas stove some distance away. The damage has not yet been estimated, but the department was provided with fire-proof appliances, as a result of which the damage was confined to the one floor. The business of the firm has been slightly interfered with, but it is anticipated that in a few days fresh stocks will be obtained and normal operations resumed.

PROFESSOR FRANCIS, the Dean of the Faculty of Chemistry in Bristol University, addressing the Rotarian Club on Monday, on "Chemistry and the War," said that in fine chemistry Germany's position was immeasurably superior to ours. Based on the dye industry, it was independent in war. The ammonia future of Europe lay with Germany, who was in a position to supply essential fertilisers to the whole of Europe. The safety of our Empire depended on our establishing an industry such as Germany's, and it must be established irrespective of preconceived notions about fiscal policy. The most alarming outcome of the war was the new chemical arm—an advance comparable to that of the firearm over the bow and arrow, with possibilities infinitely greater. It if were possible to create fog for any length of time the nation that first discovered it had the rest of the world in its pocket. Germany was in a better position to-day than before the war. It would take us a generation to compete on even terms with the German chemical industry.

ALTHOUGH no official announcement has yet been made, private advices have been received that at the tender for 250,000 tons of nitrate, held on February 26, at the minimum price of 17s., only 45,000 tons were applied for at 17s. 1½d. to 17s. 2d. per quintal, although at the previous tender, when 500,000 tons were offered and for which the average price received was 15s. 1½d., about 1½ million tons were applied for. Big dealers in the trade feel the price of nitrate has been forced up by the Nitrate Producers' Association to an unduly high level, and it is felt that until freights fall considerably from the present high level, 17s. is too high a figure to buy at in advance, so far as Europe is concerned. Considerable purchases have been made for America at up to 17s. 6d., but that market is filled for the present. In trade circles it is thought that in the best interests of the companies a price of 15s. to 16s. is quite high enough, and one which will bring them profits far in excess of anything they have ever hitherto looked for, and it is hoped, therefore, that the association will eventually decide to fix their selling price for the balance of this year's production at something lower than 17s., when it will be readily taken up by buyers.

MR. C. S. GARNETT, F.S.C., of Sheffield University, after two years' research, has discovered in the Peak district of Derbyshire valuable mineral deposits important both to commerce and geological research. The most important mineral disclosed is nickel ore. Specimens of this mineral have now been found at mine workings at Warrencar, Darley Dale. The nickel deposit, which has an average thickness of about ½ in., is a pale green emerald incrusting deposit upon surfaces of dolomite, which have been thoroughly decomposed by weathering. The purer portions appear as somewhat vitreous crusts, but the mass contains a large amount of hydrozincite, which renders it pale in colour, and dull in lustre. Another discovery is of amethyst. This, like the nickel, is a new discovery, and never before found in Peakland. Large and beautiful amethysts have been found at Calton Hill, near Buxton, where cavities lined with quartz occur in the basalt agglomerate. Near Darley also small specimens have been unearthed from cavities in the much decomposed lava. A very rare variety of red fluor spar, of much finer colour than the examples in the British Museum, has also been found in a small vein near Ashover.

PROFESSOR H. E. ARMSTRONG, in an article on dyestuffs in the *Glasgow Herald*, says that little of the "go" noticeable among the users of heavy chemicals and in the soap industry has been shown by the dyestuff users. The success of the industry in this country (he says) will only be secured if within the next few years the necessary leaders are discovered—vigorous young men, with proper social qualifications, broadly trained and gifted with the commercial and technical ability without which the infinitely complex problems of the industry cannot be appreciated. Strangely enough, we have had such men in the heavy chemical trade but never in the organic. We have never cultivated organic chemistry properly, and even now do not grasp its potentialities. Our professoriate is now being lured into industry; however much this may be to the present advantage of industry, and however much it may serve as a bait to intelligence to take up science, the withdrawal of the best brains from academic service must have the most serious consequences. The greatest possible disservice to chemical science and to chemical industry has been done, for example, by the recent transfer of Professor Robinson from the Chair of Organic Chemistry at Liverpool to the Research Department of the British Dyestuffs Corporation at Huddersfield. The manufacture of organic chemicals, which very few are competent to carry on, is of far greater importance to the country, and, indeed, to the dyestuff and other industries, than is that of dyestuffs.

References to Current Literature

Only articles of general as distinct from specialised interest are included and given in alphabetical order under each geographical subdivision. By publishing this digest within two or three days of publication or receipt we hope to save our readers time and trouble; in return we invite their suggestions and criticisms. The original journals may be consulted at the Patent Office or Chemical Society's libraries. A list of journals and standard abbreviations used appeared in our issue of December 27 last.

British

- ABRASIVES.** The manufacture of artificial abrasives in the electric furnace. C. J. Brockbank. *J. Soc. Chem. Ind.*, February 28, 41-44 T. An interesting account of the manufacture of silicon carbide, aluminous abrasives, corundum, &c.
- ANALYSIS.** A rapid method of estimating water in crude camphor. K. W. Lane and O. F. Lubatti. *J. Soc. Chem. Ind.*, February 28, 50 T.
- CHLORIDES.** Solidification points of mixtures of metallic chlorides. F. C. A. H. Lantsberry and R. A. Page. *J. Soc. Chem. Ind.*, February 28, 37-41 T. The binary and ternary mixtures of sodium, potassium, and calcium chlorides have been investigated.
- GAS.** Presidential Address to the Manchester District Institution of Gas Engineers. E. H. Hudson. *Gas World*, February 28, 176-179. Many topics of interest in connection with gas manufacture are touched upon.
- LABOUR.** The International Labour Conference and the eight-hour day. S. Miall. *J. Soc. Chem. Ind.*, February 28, 68-70 R. An account of the decisions of the recent Conference at Washington on this subject.
- LEAD.** An attempt to determine if common lead can be separated into isotopes by centrifuging. J. Joly and J. H. J. Poole. *Phil. Mag.*, March, 372-375. No evidence of separation was obtained. The effect of centrifuging certain alloys while in the liquid state. J. Joly and J. H. J. Poole. *Phil. Mag.*, March, 376. Experiments with lead-silver, lead-tin, and lead-tin-bismuth alloys are recorded.
- LINSEED OIL.** A consideration of some factors affecting the oxygen absorption of linseed oil. A. de Waele. *J. Soc. Chem. Ind.*, February 28, 48-50 T.
- MINERAL OILS.** Some notes on the formolite reaction, including the reaction of methylal with unsaturated cyclic hydrocarbons. L. G. Radcliffe. *Perf. and Essent. Oil Rec.*, February, 48-50. Some laboratory tests on mineral oils. A. Philip. *J. Inst. Pet. Tech.*, January, 5-81. Full details of many useful tests are given. The conservation of oil. P. Dumas. *J. Inst. Pet. Tech.*, January, 82-97. The waste of oil and some methods for preventing it are discussed.
- PERFUMES.** A dictionary of odoriferous substances. T. H. Durran. *Perf. and Essent. Oil Rec.*, February, 45-47. This (the first) instalment deals with the odours of hydrocarbons.
- SAFETY LAMPS.** The safety lamp and its use in chemical industry. W. Payman. *J. Soc. Chem. Ind.*, February 28, 67-68 R. The types of safety lamps are described, with notes on methods of testing them and some of their uses.
- TOLUOL.** Estimation of paraffins in commercial toluol. E. Lewis. *J. Soc. Chem. Ind.*, February 28, 50 T. A description of a method used in some of H.M. factories. A criticism of the method by H. G. Colman is appended.
- TUNGSTEN.** Notes on tungsten ore deposits in Burma. J. C. Brown. *J. Soc. Chem. Ind.*, February 28, 44-48 T. A useful paper describing the origin and treatment of these ores.

French

- ANALYSIS.** Application of the method of determining mercury by zinc filings to organic mercury compounds. M. Francois. *J. Pharm. Chim.*, February 1, 85-91.
- COPPER ALLOYS.** The alloys of copper, zinc, and nickel. L. Guillet. *Comptes rend.*, February 25, 460-462. The peculiar properties of these alloys (up to 15 per cent. Ni) are recorded.
- POISONING.** Poisoning by sodium fluoride. C. Vallée. *J. Pharm. Chim.*, January 1, 5-8. A case of poisoning due to pancakes made with sodium bicarbonate containing fluoride is recorded.
- POISON-GAS.** Poison gases employed during the war. G. Patein. *J. Pharm. Chim.*, January 1, 19-28. The preparation, properties and uses of the various gases are given.

United States

- AMMONIA.** The vapour pressure of ammonia. C. S. Cragoe, C. H. Meyers and C. S. Taylor. *J. Amer. Chem. Soc.*, February, 206-229. Equations for calculating the vapour pressure between -80° and $+70^{\circ}\text{C}$. are given, together with the figures.
- ANALYSIS.** A study of the determination of amino-acids by means of the hydrogen electrode. E. L. Tague. *J. Amer. Chem. Soc.*, February, 173-184.

The determination of chlorine with the nephelometer. A. B. Lamb, P. W. Carleton and W. B. Meldrum. *J. Amer. Chem. Soc.*, February, 251-259. The nephelometric measurement of silver chloride opalescence is described.

Quantitative determination of traces of dichloroethyl sulphide (mustard gas) in air. M. Yablick, G. St. J. Perrott and W. H. Furman. *J. Amer. Chem. Soc.*, February, 266-274.

ARSENATES. The arsenates of calcium. Equilibrium in the system arsenic pentoxide, calcium oxide, water at 35° (acid section). C. M. Smith. *J. Amer. Chem. Soc.*, February, 259-265.

CYANIDE. Some aspects of cheap cyanide processes. H. Philipp. *Chem. & Met. Eng.*, February 18, 313-317. A review of the commercial possibilities of some modern processes for making cyanides.

FUELS. Liquid fuels. *Chem. & Met. Eng.*, February 18, 296-297. Report of a discussion before a joint meeting of the Amer. Electrochem. Soc., Amer. Chem. Soc., and Soc. Chem. Ind., with notes on papers by D. Wesson (vegetable oils as fuel) and B. R. Tunison (alcohol as motor fuel).

FURNACES. Surface versus Bunsen combustion in gas-fired furnaces. O. L. Kowalhe. *Chem. & Met. Eng.*, February 18, 320-321. An abstract of an address before the Western Society of Engineers.

INDUSTRIES. Some developed mineral resources and chemical industries of the Southern States. A. M. Fairlie. *Chem. & Met. Eng.*, February 18, 307-312. The phosphate, sulphur, sulphuric acid and copper industries are dealt with principally.

NITROGEN. Theoretical study of nitrogen fixation by the electric arc. C. P. Steinmetz. *Chem. & Met. Eng.*, February 18, 299-304. A valuable study of the dynamics of the process.

ORGANIC REAGENTS. Organic chemical reagents. O. Kamm and C. S. Marvel. *J. Amer. Chem. Soc.*, February, 299-309. R. Adams and C. S. Marvel, *ibid.*, 310-320. The papers deal with the preparation of alhyl and alhylen bromides, and of reagents from normal butyl alcohol respectively.

STEAM. Tests on small engines at high back pressures. A. E. Flowers and R. J. Pepper. *Chem. & Met. Eng.*, February 18, 318-320. The effect of back pressure on steam consumption in steam-driven compressors has been studied.

URANIUM. Brannerite, a new uranium mineral. F. L. Hess and R. C. Wells. *J. Franklin Inst.*, February, 225-237. A new complex titanate of uranium is described.

German

AMMONIA. The catalytic oxidation of ammonia to nitric acid. B. Neumann and H. Rose. *Z. angew. Chem.*, February 17 and 24, 41-44, 44-48. These are the first two parts of a paper dealing with the influence of varying conditions on the process, using a platinum catalyst.

COAL. Results of modern investigations on coal and their influence on the gas industry. P. Schläpfer. *Feuerungstechnik*, February 1, 77-81. The origin of coal, high and low temperature carbonisation, the effect of reagents and extraction with solvents are discussed.

CYANAMIDE. The improvement of calcium cyanamide. J. Baumann. *Chem.-Zeit.*, February 21, 158-159. Various methods of increasing the fertiliser value of this product are discussed.

FUEL. Peat dust firing in Sweden. P. Wangemann. *Feuerungstechnik*, January 1, 53-58. An account of the preparation and use of peat dust for boilers, including suitable drying plant. Coal dust firing in America. A. Wagner. *Feuerungstechnik*, January 1, 58-62.

Miscellaneous

ANALYSIS. Analytical chemistry of the present day. L. Moser. *Oesterr. Chem.-Zeit.*, February 1, 16-20. Conclusion of paper already noted. (THE CHEMICAL AGE, 1920, 233.)

STEEL. Woody structures of fractures of transverse test-pieces taken from certain special steels. J. J. Cohade. *Chem. & Met. Eng.*, February 11, 259-264.

IRON. Lead-coated iron. C. Baskerville. *J. Ind. Eng. Chem.*, February, 152-154. The use of lead protection for ironwork is described.

MEDAL. Perkin Medal Award. *J. Ind. Eng. Chem.*, February, 183-195. An account of the proceedings at the presentation of the medal to Prof. Chandler on January 16.

STEEL. Use of spiegeleisen in steel manufacture. H. D. Hibbard. *Chem. & Met. Eng.*, February 4, 209-210.

Patent Literature

We publish each week a list of selected complete specifications accepted as and when they are actually printed and on sale. In addition, we give abstracts within a week of the specifications being obtainable. Readers can thus decide what specifications are of sufficient interest to warrant purchase, the only way of obtaining complete information. A list of International Convention specifications open to inspection before acceptance is added, and abstracts are given as soon as possible.

Abstracts of Complete Specifications

- 112,275. ORES, PROCESS AND APPARATUS FOR THE TREATMENT OF—IN THE BLAST FURNACE. L. P. Basset, 92, rue de la Victoire, Paris. International Convention date (France), December 22, 1916. Patent of Addition to 109,452, September 7, 1916.

In the principal patent a blast furnace is charged with the ore, e.g., iron oxide, and additional materials to facilitate the melting of the slag. The air which is injected into the lower part of the furnace is mixed with very finely divided carbon, which is supplied by an endless screw conveyor into one or more of the air tuyers. The proportions of the air and carbon are so determined that practically only carbon monoxide is produced by the combustion, and is thus available for effecting the chemical reaction. The present improvement consists in the use of very finely divided carbon preferably in the form of flour for effecting the reduction of the iron oxide, and also a hard carbon, such as anthracite, which is not so finely divided for combining with the iron to produce cast iron. The finely divided carbon is added in such quantity that it is just burnt completely, and the coarser carbon in such quantity as to produce a metal having the desired carbon content. The coarser carbon is supplied by an auxiliary conveyor into the air tuyers. Reference is directed in pursuance of Section 7, Sub-section 4, of the Patents and Designs Act, 1907, to Specification No. 109,452, as open to inspection under Section 91 (3) (a) of the Act (International Convention), and in pursuance of Section 8, Sub-section 2, to Specification No. 109,452 as accepted.

- 132,795. BROMOACYLISED UREA COMPOUNDS, MANUFACTURE OF DERIVATIVES OF. Farbenfabriken vorm. Friedr. Bayer & Co., Leverkusen, near Cologne, Germany. International Convention date (Germany), August 9, 1917.

Bromoacylised urea compounds are treated with acylising agents in the presence of condensing agents to produce acyl products. As an example, 474 parts of bromodiethylacetyl urea are mixed with 1,000 parts of acetic acid anhydride and 75 parts of zinc chloride, and heated on a water bath at 60°C. for one hour. The mixture is cooled and then stirred into 3,000 parts of water at 0°C. The crystals are filtered off, and then re-crystallised from hot dilute alcohol. The product is acetyl bromodiethylacetyl urea which has a melting point of 108° to 109°C., and is soluble in alcohol, ether, acetone, chloroform, and acetic ester, but only slightly soluble in water. Other examples are given of the treatment of *a*-bromoisovaleryl urea with acetic acid anhydride and sulphuric acid to produce acetyl bromoisovaleryl urea; the treatment of bromodiethylacetyl urea with propionic acid anhydride and sulphuric acid to produce propionyl bromodiethylacetyl urea; and the treatment of bromodiethylacetyl urea with benzoic acid anhydride and sulphuric acid to produce benzoyl bromodiethylacetyl urea.

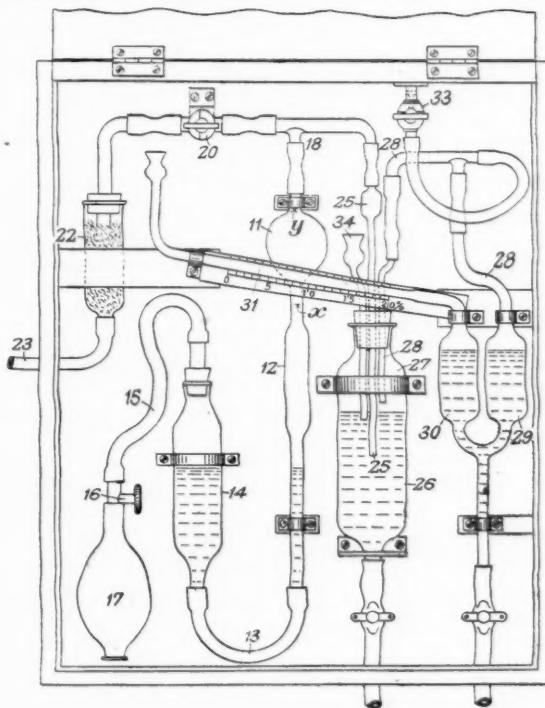
- 138,137. ANTIMONY COLOURS, PREPARATION OF. E. F. Morris, Holly Bank, Roby, near Liverpool. Application date, October 8, 1918.

The object is to produce antimony colours which may be used in vulcanised indiarubber. An antimony salt is mixed with alkali waste liquor or a similar solution and treated with an excess of sulphuric or hydrochloric acid which precipitates some sulphur with the antimony sulphide, the sulphur being useful in vulcanisation processes. As an example, the product of the reaction of antimonious oxide and 50 per cent. sulphuric acid is diluted until it contains the equivalence of antimonious oxide 8.5 parts, sulphuric acid 42 parts, and water 112 parts. The mixture is warmed to about 30° to 35°C., and a solution of 7 parts of crystallised sodium thiosulphate in 300 parts of alkali waste liquor at 7°Tw. is added while stirring. The colour formed is washed until substantially neutral. In a modification, an alkaline antimony solution produced by the action of sodium hydroxide or sulphide on antimony sulphide

may be used. The alkali waste liquor may be wholly or partly replaced by a solution obtained by boiling together water, lime, and sulphur with or without the addition of soluble thiosulphate. Combinations of the above alternatives may be used.

- 138,156. FURNACE GASES, APPARATUS FOR ASCERTAINING THE COMPOSITION OF. F. Cossor, Accoson Works, Vale Road, Tottenham, London, N.4. Application date, January 23, 1919.

A sample of furnace gas is passed through a caustic potash solution and the volume of gas absorbed is measured. The reservoir 14 contains a mixture of glycerine and water, and is connected at one end by a tube 15 to an indiarubber pumping ball 17, and at the other end by tubes 13, 12 to a glass measuring bulb 11. This bulb is connected by a T-piece 18 and stop cock 20 to a gas filter 22. The tube 23 is connected to the furnace, and the stop-cocks 20 and 33 and the venting plug 16 are opened to permit all the liquid columns to find their natural levels. The stop-cock 33 and venting plug 16 are then closed, and the liquid in the reservoir 14 is forced by pressing the bulb



138,156

17 into the measuring bulb 11 to expel the gas from it. The plug 16 is then opened to relieve the pressure and allow the liquid to return to reservoir 14 and draw in a charge of furnace gas through the filter 22 to fill the measuring bulb 11. The plug 16 is again closed and the bulb 17 is pressed until the liquid rises to the marked level *x*, when the stop-cock is closed and the bulb 11 contains the test volume of furnace gas. The bulb 17 is then pressed until the liquid rises to the marked level *y*, so that the test volume of gas is forced through the tube 25 into and through the caustic potash solution in the vessel 26. The unabsorbed gas rises into the space 27 and exerts pressure through the tube 28 on the liquid in one limb 29 of a manometer. The liquid in the limb 30 is thus forced upwards along the slightly inclined tube 31, by the side of which a scale is ar-

ranged to show the percentage of gas absorbed. The inclined tube 31 may be given any desired bore, so as to obtain any degree of sensitiveness required. The inclination of the tube 31 should be only sufficient to ensure the prompt return of the liquid from the tube into the manometer. The caustic potash is replenished through the filling tube 34, and valves 36, 38, are provided for removing the solutions when required.

138,211. TUNGSTATES, METHOD OF OBTAINING PURE. J. B. Ekeley and W. B. Stoddard, Boulder, Colo., U.S.A. Application date, March 20, 1919.

The object is to prepare pure tungstates free from compounds of phosphorus and arsenic. A tungsten ore, such as wolframite, hubnerite, ferberite, scheelite, or tungstite is crushed, sampled, and ground to a degree of fineness which varies with the nature of the ore. About 40 to 100 per cent. of sodium chloride is added, and also sodium carbonate sufficient to combine with the whole of the tungstic acid, the excess of sodium carbonate combining with the silica in the ore to produce sodium silicate. If necessary, silica may be added for this purpose. The sodium chloride may be replaced by sodium fluoride, or calcium chloride or fluoride, and sodium nitrate or chlorate may be added to provide oxidising agents. The mixture is fused in a suitable furnace, allowed to cool, crushed, and extracted with water. The mixture is filtered, and the filtrate contains sodium tungstate solution mixed with compounds of phosphorus and arsenic. The solution is heated, and a soluble magnesium salt, such as the chloride or nitrate is added in excess of the amount necessary to precipitate magnesium phosphate and arsenate and to provide a sufficient quantity of the magnesium salt to be detected by the ammonium magnesium phosphate test. The solution is then brought to boiling point, and treated with a solution which is made by adding ammonia to a solution of a hypochlorite. The hypochlorite is preferably prepared by mixing bleaching powder with water, adding sodium carbonate or bicarbonate potassium carbonate or bicarbonate, or sodium or potassium sulphate, and filtering off the hypochlorite solution. The addition of this solution to the impure sodium tungstate precipitates all the phosphorus and arsenic, and pure sodium tungstate is thus obtained. The precipitate carries with it some sodium tungstate, which is recovered by passing the sludge through a filter press, partly drying the solid material, and adding it to a fresh quantity of the tungsten ore, which is then treated as described above so that the process is continuous.

138,228. ALLOY AND METHOD OF MAKING AND USING SAME. A. G. Mumford, Ltd., and A. G. Mumford, Culver Street Engineering Works, Colchester, Essex. Application date, April 14, 1919.

A white metal alloy is first made, composed of tin 61 per cent., copper 29.7 per cent., and zinc 9.3 per cent. Another alloy is then made containing 19.64 per cent. of this white metal and 80.36 per cent. of copper. The alloy is particularly suitable for making castings of floats which are subjected to high and variable temperature and pressure.

138,272. ELECTRIC FURNACES, MATERIAL FOR THE MANUFACTURE OF ELECTRODES OF. O. R. Olsen, 6B, Tordenskjoldsgate, Christiania. Application date, August 6, 1919.

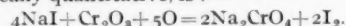
Electrodes are constructed of the ordinary mixture, which may consist of anthracite, coke, waste of electrodes, retort graphite, tar, pitch, &c., with the addition of pulverised concentrates of copper or iron ores to the amount of about 25 per cent. The electrodes are intended for use in the electric smelting process for the production of copper, iron, iron alloys and steel, and the addition of any special catalyst is rendered unnecessary.

138,286. MIXING APPARATUS. R. B. Grey, Lloyds Avenue, London, E.C.3. Application date, September 5, 1919.

A mixing tank is provided with a paddle at the bottom, carried by a vertical shaft passing down through the tank, and provided at the top with a bevel wheel to transmit the drive from a power shaft. Several vertical baffle plates, preferably deeper at one end than the other, are arranged radially in the tank, and may be adjusted vertically to get the best mixing effect. The plates are carried by vertical supports passing through the cover, and may be fixed at any desired height.

138,291. ALKALI CHROMATES AND IODINE, MANUFACTURE OR PRODUCTION OF. R. L. Datta, 78, Manicktola Street, Calcutta. Application date, September 23, 1919.

The object is to obtain iodine from alkali iodides by the use of atmospheric oxygen, and at the same time to obtain alkali chromate equivalent to the alkali originally present in the iodide. The iodide is mixed with chromium sesquioxide or with chrome iron ore in excess of that required to decompose the iodide. The mixture is then gradually heated to redness in a current of air and steam, when iodine is liberated and is passed into a condenser. The residue consists of practically pure alkali chromate, with a little unchanged chromium sesquioxide or chrome iron ore, and iron oxide. The reaction, which is practically quantitative, is:—



The residue is lixiviated with water to recover the chromate.

International Specifications Not yet Accepted

137,045. DISTILLING; COKING. M. J. Berg, Hagenu, Alsace. International Convention date, December 21, 1918.

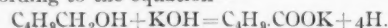
Wood, coal, hydrocarbons, &c., are mixed with some other substance which evolves vapour at a lower temperature, and then distilled. Distillation thus takes place at a lower temperature, and decomposition is minimised. As an example, residue from Galician petroleum, the boiling point of which is above 350°C., may be mixed with dry sawdust and distilled at 300°C., leaving a carbonised residue. The solid material in the still absorbs the asphaltic constituents and the oil distillate is refined by the charcoal and the vapour of acetic acid and methyl alcohol. The hydrogen evolved acts as a reducing agent on the unsaturated hydrocarbons in the presence of the charcoal as a catalyst.

137,052. EVAPORATING LIQUIDS. Soc. Anon. d'Exploitation de Procédés Evaporatoires Systeme Prache et Bouillon, 14, Rue de Rome, Paris. International Convention date, December 24, 1918.

An evaporator consists of a set of inclined externally heated tubes, opening into a header at each end. The upper and lower headers are connected to vertical and horizontal pipes respectively which meet and form a return circuit. The liquid is kept in circulation by a pump at the junction of the vertical and horizontal pipes. In order to prevent incrustation on the heating surfaces, a powder having a mechanical cleaning action, such as sand or glass, is added to the circulating liquid and is carried round in suspension. The overflow pipe for the liquid projects downwards into the vertical pipe and is of such a size that the overflowing liquid does not carry the powder with it as it flows upwards. When not in use, the powder collects at the bottom of the apparatus and is brought into suspension by injecting steam.

137,064. ALKALI VALERATES. Soc. Darrasse Freres et Cie, 13, Rue Pavée, Paris, and L. Dupont, 2, Villa David, Vincennes, Seine, France. International Convention date, December, 3, 1918.

Potassium valerate is prepared in an autoclave by the reaction of caustic potash or caustic soda on amyl alcohol in excess according to the equation—

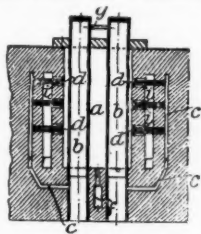


The pressure is maintained at such an amount that the amyl alcohol remains liquid at the temperature employed, and the hydrogen is allowed to escape through a pressure regulator. As an example, a mixture of amyl alcohol and caustic soda may be heated to 235° to 240°C., the pressure being maintained at 18 atmospheres.

137,065. CARBON PRODUCTS FROM GAS. Rutgerswerke Akt.-Ges., 30, Dorotheenstrasse, Berlin. International Convention date, June 12, 1918.

The object is to obtain soot, graphite, &c., from natural gas by heating it in retorts. A number of vertical retorts *b* are arranged in a combustion chamber *a* and the gas is supplied to them through lateral pipes *g* at the top, connected to a common supply pipe. The velocity of the gas is adjusted so that only about 65 per cent. of the gas is decomposed, and the waste gas, which is still combustible, passes out through passage *c* to the burner nozzles *d*. The gas is burned with air

which is supplied through the concentric nozzles *i*, and the hot waste gas from the combustion chamber *a* is passed through

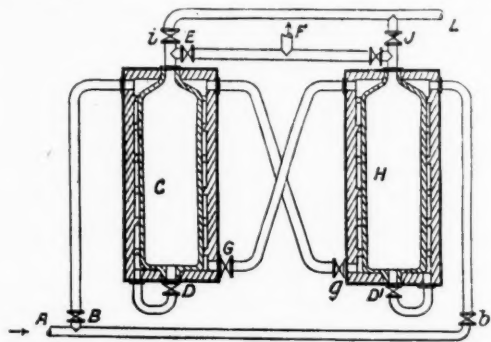


137,065

a flue *f* to a recuperator where the air for combustion and also the gas to be decomposed, are heated.

137,071. NITROGEN OXIDES. Norsk Hydro-Elektrisk Kvaelfabrikationselskab, 7, Solliqatzen, Christiania. International Convention date, October 21, 1916.

Gas containing a small proportion of oxides of nitrogen is passed through an absorbent consisting of a mixture of an alkali or alkaline earth hydrate and one or more of the oxides of iron, zinc and aluminium, which form compounds with the alkalis and alkaline earths which are easily decomposed. The absorbent is then heated, and the oxides of nitrogen are obtained in concentrated form. The hot gas containing oxides of nitrogen passes from a main *A* through a valve *B* to the



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jacket of the retort *C* which contains saturated absorbent from a previous operation. Part of the hot gas also passes through the valve *D*, or through openings in the retort walls into the retort, the valves *b*, *g*, *i* being closed. Oxides of nitrogen are driven off through the valve *E* and pipe *F*. The remainder of the heating gas passes through the valve *G* to the jacket of the retort *H*, and then through the valve *D'* into the retort, which contains fresh material to absorb the oxides of nitrogen. After the operations in the two retorts *C* and *H* are completed, the valves *b*, *g*, *i* are opened and the valves *B*, *G*, *J* are closed, so that the functions of the retorts are interchanged. The absorbing retort may be kept at 400°-500°C., and the retort in which the oxides of nitrogen are liberated may be placed under vacuum, or steam may be passed into it to facilitate release of the gas.

LATEST NOTIFICATIONS.

- 139,147. Condensation Products of Phenols and Aldehydes, Process for the Pectisation of. L. Jaloustre, Z. Kheifetz, and M. Warchavsky. February 15, 1919.
- 139,153. Oxaldehydes and their Ethers, Process of Manufacture of. A. Weiss. February 18, 1919.
- 139,156. Decolourising Carbon, Method of Making. C. S. Hudson. February 15, 1919.
- 139,159. Liquids, Purification of. Koppers Co. February 15, 1919.
- 139,160. Zinc, Production of. B. Raeder and Zink Aktieselskabet. February 15, 1919.
- 139,168. Phenoloid Bodies, Purification of Liquors containing. Koppers Co. February 15, 1919.
- 139,171. Cellulose, Manufacture of. C. A. Braun. May 29, 1918.

- 139,172. Sulphur Contained in Blast Furnace Slag, Method and Arrangement for Utilising. L. H. Diehl. January 16, 1917.
- 139,173. Sulphur in Blast Furnace Slag, Arrangement for Recovering—by Blowing Air Through. L. H. Diehl. September 24, 1917.
- 139,194. Aluminium, Method of Producing. V. Gerber. February 18, 1919.
- 139,195. Aluminium Nitride. V. Gerber. February 18, 1919.
- 139,196. Carbonising Coal, Process and Apparatus for. H. J. Bull. February 19, 1919.
- 139,210. Filters for Oil Presses. Soc. Anon. des Etablissements A. Olier. April 4, 1914.
- 139,215-6. Crushing Apparatus, Gyratory. J. E. Kennedy. January 14, 1918, and October 23, 1917.
- 139,219 and 139,220. Crushing and Pulverising Machine. J. E. Kennedy. February 4, 1914, and March 6, 1914.

Specifications Accepted, with Date of Application

- 123,323. Gas Producers. L. Fornas. February 13, 1918.
- 128,552. Mono- and di-oxymethylanilino Benzoic Esters, Manufacture of New. Soc. Chimique des Usines du Rhone. June 20, 1918.
- 131,870. Ammonia, Transformation of Synthetic—into a Transportable Product Directly Utilisable for Agriculture in Conjunction with the Production of Carbonate of Soda. Soc. l'Air Liquide. (Soc. Anon. pour l'Etude et l'Exploitation des Procédés G. Claude). August 24, 1918.
- 138,372. Amines, Production of Aromatic. E. C. R. Marks. (E. I. Du Pont de Nemours & Co.). July 18, 1917.
- 138,387. Stone, Ore, and the like—Materials, Machines or Apparatus for Breaking or Crushing. E. Helme. November 12, 1918.
- 138,388. Oils and other Liquids, Process and Apparatus for Deodorising, Purifying, Distilling and Vapourising. J. T. Bateman. November 14, 1918.
- 138,406. Electrolytic Cells. H. W. Matheson. January 23, 1919.
- 138,411. Grinding and Pulverising Materials. W. C. Kirby and E. L. Lakin. January 29, 1919.
- 138,443. Ores, Mechanical Furnace for Roasting. Huntington, Herberlein & Co. and H. C. Bingham. February 22, 1919.
- 138,466. Grinding or Pulverising Ores, Clinker, or the like, Process and Apparatus for. R. Forsyth. March 13, 1919.
- 138,472. Sulphurous Ores, Roasting Furnaces for. Soc. Anon de Vedrin and J. Marcotty. March 18, 1919.
- 138,486. Barium Chloride and other Chlorides of the Alkaline Earth Metals, Process for the Preparation of. F. B. Shroff. April 1, 1919.

China Clay Action Arranged

On Tuesday Mr. Justice Lush, sitting without a jury in the King's Bench Division, was to have heard the action brought by the Paper Makers' Chemical Co. *v.* the St. Austell China Clay Works, Ltd. When the case was called on, Mr. Maddocks said the dispute was over the delivery of a quantity of china clay to the plaintiffs, but the defendants were now willing to give delivery of certain of the goods, and to withdraw their counter-claim. It was proposed that the matter should stand over for six months, in order to give the defendants an opportunity of carrying out the arrangement. His Lordship assented to this course being taken.

Martens & Co. *v.* Aniline Dye & Chemical Co

THE case of R. Martens & Co., Ltd., *v.* the Aniline Dye & Chemical Co., Ltd., was mentioned before Mr. Justice Rowlatt, sitting without a jury on Tuesday, when counsel stated that this was a claim for £1,050 for the return of money paid by the plaintiffs to the defendants for goods sold and delivered. His Lordship asked if an arrangement had been come to, and counsel said that the settlement was that defendants consented to a judgment of £1,100.

Action Against Newcastle Chemical Firm

ON Thursday, February 26, in the King's Bench Division, Commercial Court, before Mr. Justice Roche, the action by the Anglo-Chemical & Colour Co., Ltd., of London, against Messrs. Thomas Hedley & Co., Ltd. of Newcastle, was settled on terms agreed between the parties and endorsed upon Counsel's briefs. There would be a judge's order if necessary. Mr. MacKinnon, K.C., and Mr. Maddocks appeared for the plaintiffs, and Mr. Wright, K.C., and Mr. Jardine for defendants.

Books Received

- QUALITATIVE ANALYSIS IN THEORY AND PRACTICE. By P. W. Robertson, M.A., Ph.D., and D. H. Burrell, A.R.C.S., D.I.C., B.Sc. Edward Arnold, London. Pp. 63. 4s. 6d. net.
- FUEL PRODUCTION AND UTILISATION. Rideal's Industrial Chemistry Series. By Hugh S. Taylor, D.Sc. Ballière, Tindall & Cox, London. Pp. 297. 10s. 6d. net.

Monthly Market Report and Current Prices

Our Market Report and Current Prices are exclusive to THE CHEMICAL AGE, and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co. and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The weekly report contains only commodities whose values are at the time of particular interest or of a fluctuating nature. A more complete report and list are published once a month. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.

British Market Report

THURSDAY, March 4.

There is very little change to report. The demand for all chemicals continues active and the markets are exceptionally strong. There is perhaps a steadier tendency noticeable, and this is all to the good.

The export demand continues unabated, especially for the heavy products.

General Chemicals

ACETONE is in good demand and price is without change.

ACID ACETIC is active and very firm, and there is a tendency for a further advance.

ACID CARBOLIC is now becoming in exceedingly short supply, and the price is higher.

ACID CITRIC is nominally without change, and is practically unobtainable.

ACID FORMIC is in very fair demand, and price is without change.

ACID OXALIC continues scarce for near delivery, and full prices are obtained for any parcels which become available.

ACID TARTARIC is in request, especially on export account, and price is a shade higher.

AMMONIUM SALTS are all very active. Chloride has again advanced, and there is a better inquiry for Carbonate.

BARIUM SALTS are in fair request. Chloride is wanted and is very firm.

BLEACHING POWDER is nominally without change, but it is practically unobtainable on the spot.

CALCIUM ACETATE is in short supply, and the price has again advanced.

COPPER SULPHATE is only a quiet market, and it would seem that Continental buyers cannot keep in the market much longer.

IRON SULPHATE (GREEN COPPERAS) is in good request, and price is without change.

LEAD SALTS are all very quiet. Acetate is moving off very well.

LITHARGE has been again advanced in price by the manufacturers. LITHOPONE is very scarce, and price is higher for spot deliveries.

MAGNESIUM SALTS are more active, and there is a very good trade passing in sulphate.

POTASSIUM BICHRONATE is badly wanted, especially on export account, and premiums are being paid on makers' prices for spot delivery.

POTASSIUM CARBONATE appears to be in better supply, but the price is nominally without change.

POTASSIUM NITRATE is in request at makers' prices.

POTASSIUM PERMANGANATE is becoming extremely scarce, and there is a further advance to report.

POTASSIUM PRUSSATE is more active, and the price is a shade firmer.

SODIUM ACETATE is in good request at last figures.

SODIUM BICARBONATE is wanted on export account.

SODIUM BICHRONATE has again advanced, and the open market price for spot delivery has very nearly reached that of potash.

SODIUM CHLORATE is an easy market.

SODIUM CAUSTIC is still called for and any parcels appearing on the market are eagerly snapped up.

SODIUM HYPOSULPHITE is becoming extremely scarce, and price is firm.

SODIUM NITRITE is again higher, and is practically unobtainable for near delivery.

SODIUM PHOSPHATE is moving off well, and price is nominally without change.

SODIUM PRUSSATE is very firm, and price is maintained at last figures.

SODIUM SULPHIDE is now becoming extremely scarce for near delivery.

ZINC SALTS are in better request, and prices are inclined to be firmer.

Coal Tar Intermediates

Prices of all products are well maintained, and many articles are in extremely short supply.

ACETANILIDE.—The price is well maintained, and there are only short supplies available.

BENZALDEHYDE is moving off fairly well.

BENZIDINE BASE is practically unobtainable, except in very small quantities for near delivery, and high prices are quoted for forward.

BETA NAPHTHOL is still exceedingly scarce, and fancy prices have apparently been paid for spot parcels in second hands.

DIPHENYLAMINE is in very short supply, and price is firm.

NAPHTHIONATE OF SODA is now becoming extremely scarce, owing to the shortage of raw material.

ORTHO NITRO TOLUOL can be obtained in fair quantities at last quoted prices.

PARANITRANILINE is without change, and there are only very scant supplies available.

PARAPHENYLENEDIAMINE is becoming scarcer and price is inclined to rise again.

SALICYLIC ACID is very firm, and near delivery is not now possible.

Coal Tar Products

Prices still remain very firm, and supplies are somewhat scarce. 90'S BENZOL has a slightly easier tendency, the price being from 2s. 6d. to 2s. 6½d. f.o.b. makers' works.

CRESYLIC ACID.—Supplies are still scarce, and the price is 4s. on rails for pale 97/99 per cent., and 3s. 6d. for dark 95/97 per cent.

CREOSOTE OIL.—The price is from 10½d. to 11d. in the North, and 11d. to 11½d. in the South.

NAPHTHA.—Both solvent and heavy naphtha can be bought in the region of 3s. 4d. on rails at makers' works.

NAPHTHALENE is stiffening, and the price is about £24 for refined, and the crude is worth from £8 to £10.

PITCH.—The position is unchanged and the demand remains good, the price still having an upward tendency. London makers are asking 130s. f.o.b., and the price f.o.b. East Coast is about 125s. per ton.

Sulphate of Ammonia

There is no change to report this week. The demand for Home trade is good and supplies are coming forward satisfactorily. Export business is quiet, which is probably due to the very high prices which are now being asked. The unfavourable rates of exchange also make business difficult.

French Market Report

During the last week or two the French market has been in a nervous state, owing to threatened labour troubles, which have now come to a head in the general railway strike, which, happily, was of short duration. The shortage in fuel continues acute and transport has not apparently improved in any way, judging by reports received.

The manufacture of dyestuffs in France is slowly but steadily increasing. If export licences could be obtained trade could be done in English colours, especially in Nigrosines, &c.

ACETONE is in better demand, and some sales have been made at equal to £98 per ton.

ACID OXALIC is extremely scarce. Equal to 2s. 6d. is easily obtainable for spot parcels.

ALUM.—The shortage of this material is not so acute, as certain parcels have arrived from Italy which have eased the position.

ALUMINA SULPHATE.—The stocks which had accumulated after the armistice have now been absorbed, but buyers are still unwilling to conclude a large amount of forward business until more settled conditions prevail.

BARIUM PRODUCTS.—Sulphate is in short supply. The manufacture of Sulphide of Barium is no longer continued in France, and English manufactured material has been found satisfactory, only the price is very high, about £30 per ton C.I.F. being demanded.

BLANC FIXE.—This material is in great request, and all parcels available are easily sold.

LEAD ACETATE.—The market is improving, and the price stands to-day at about £100 per ton.

POTASSIUM PRUSSATE.—There has been a general stiffening in the price of this product, and 2s. 2d. per lb. may be taken as the ruling figure.

SODIUM BISULPHITE is in request, but buyers cannot be satisfied as to delivery. The price is about £49 per ton.

SODIUM CAUSTIC.—The French factories are very much behind in delivery, and buyers are now looking for English supplies at about £44 per ton.

SODIUM HYPOSULPHITE is readily obtainable, but price continues high.

SODIUM SULPHIDE is in such request that the price has reached the absurd price of £48 per ton.

German Market Report

It is still useless, in our opinion, quoting nominal prices obtaining on the German market. Daily increases in quotations seem to be the rule of the day, and apparently owing to the desire of a large number of people to attempt to avoid taxation, speculation is rife, and it is reported that there are a large number of speculators on the Hamburg Exchange dealing in chemicals who, previous to a few months ago, had not the slightest knowledge of the trade.

The majority of works are producing only extremely small quantities, due to the shortage of fuel and the conditions of labour.

Current Prices

Chemicals

	per	£	s.	d.	to	£	s.	d.
Acetic anhydride	lb.	0	3	3	to	0	3	6
Acetone oil	ton	80	0	0	to	83	0	0
Acetone, pure	ton	90	0	0	to	95	0	0
Acid, Acetic, glacial, 99-100%	ton	105	0	0	to	110	0	0
Acetic, 80% pure	ton	82	0	0	to	85	0	0
Arsenic	ton	95	0	0	to	97	10	0
Boric, cryst.	ton	74	10	0	to	76	0	0
Carbolic, cryst. 39-40%	lb.	0	1	4	to	0	1	4½
Acid, Citric,	lb.	0	6	0	to	0	6	3
Formic, 80%	ton	110	0	0	to	115	0	0
Gallic, pure	lb.	0	7	3	to	0	7	9
Hydrofluoric	lb.	0	0	7	to	0	0	8
Lactic, 50 vol.	ton	65	0	0	to	70	0	0
Lactic, 60 vol.	ton	80	0	0	to	85	0	0
Nitric, 80 Tw.	ton	37	0	0	to	39	0	0
Oxalic	lb.	0	2	5	to	0	2	6
Phosphoric, 1.5	ton	60	0	0	to	65	0	0
Pyrogallol, cryst.	lb.	0	11	6	to	0	11	9
Salicylic, Technical	lb.	0	3	0	to	0	3	3
Salicylic, B.P.	lb.	0	3	9	to	0	4	0
Sulphuric, 92-93%	ton	7	10	0	to	8	0	0
Tannic, commercial	lb.	0	5	0	to	0	5	3
Tartaric	lb.	0	3	9	to	0	3	10
Alum, lump	ton	19	10	0	to	20	0	0
Alum, chrome	ton	93	0	0	to	95	0	0
Alumino ferric	ton	9	10	0	to	10	0	0
Aluminium, sulphate, 14-15%	ton	15	0	0	to	15	10	0
Aluminium, sulphate, 17-18%	ton	18	10	0	to	19	0	0
Ammonia, anhydrous	lb.	0	1	9	to	0	2	0
Ammonia, 880	ton	35	0	0	to	37	10	0
Ammonia, 920	ton	20	0	0	to	24	0	0
Ammonia, carbonate	lb.	0	0	7½	to	—	—	—
Ammonia, chloride	ton	95	0	0	to	97	10	0
Ammonia, muriate (galvanisers)	ton	52	0	0	to	54	0	0
Ammonia, nitrate	ton	55	0	0	to	60	0	0
Ammonia, phosphate	ton	130	0	0	to	135	0	0
Ammonia, sulphocyanide	lb.	0	1	10	to	0	2	0
Amyl, acetate	ton	360	0	0	to	370	0	0
Arsenic, white, powdered	ton	92	0	0	to	94	0	0
Barium, carbonate	ton	13	10	0	to	14	10	0
Barium, carbonate, 92-94%	ton	14	10	0	to	15	0	0
Chlorate	lb.	0	1	4	to	0	1	5
Chloride	ton	25	10	0	to	26	10	0
Nitrate	ton	50	0	0	to	51	0	0
Sulphate, blanc fixe, dry	ton	25	10	0	to	26	0	0
Sulphate, blanc fixe, pulp	ton	15	10	0	to	16	0	0
Bleaching powder, 35-37%	ton	18	10	0	to	19	0	0
Borax crystals	ton	41	0	0	to	42	0	0
Calcium acetate, grey	ton	36	0	0	to	38	0	0
Carbide	ton	28	0	0	to	30	0	0
Chloride	ton	9	10	0	to	10	0	0
Carbon bisulphide	ton	58	0	0	to	59	0	0
Casein, technical	ton	80	0	0	to	83	0	0
Cerium oxalate	lb.	0	3	9	to	0	4	0
Chromium acetate	lb.	0	1	0	to	0	1	2
Cobalt acetate	lb.	0	7	0	to	0	7	6
Oxide, black	lb.	0	7	9	to	0	8	0
Copper chloride	lb.	0	1	3	to	0	1	6
Sulphate	ton	50	0	0	to	52	0	0
Cream Tartar, 98-100%	ton	305	0	0	to	310	0	0
Epsom salts (see Magnesium sulphate)								
Formaldehyde 40% vol.	ton	315	0	0	to	320	0	0
Formusol (Rongalite)	lb.	0	4	0	to	0	4	3
Glauber salts	ton	4	0	0	to	4	10	0
Glycerine, crude	ton	70	0	0	to	72	10	0
Hydrogen peroxide, 12 vols.	gal.	0	2	8	to	0	2	9
Iron perchloride	ton	40	0	0	to	42	0	0
Iron sulphate (Copperas)	ton	4	10	0	to	4	15	0
Lead acetate, white	ton	105	0	0	to	110	0	0
Carbonate (White Lead)	ton	75	0	0	to	78	0	0
Nitrate	ton	80	0	0	to	85	0	0
Litharge	ton	71	0	0	to	73	0	0

	per	£	s.	d.	to	£	s.	d.
Lithophone, 30%	ton	60	0	0	to	62	0	0
Magnesium chloride	ton	15	10	0	to	16	10	0
Carbonate, light	cwt.	2	15	0	to	3	0	0
Sulphate (Epsom salts commercial)	ton	13	10	0	to	14	0	0
Sulphate (Druggists')	ton	18	10	0	to	19	10	0
Methyl acetone	ton	89	0	0	to	90	0	0
Alcohol, 1% acetone	gall.	Nominal.						
Nickel ammonium sulphate, single salt	ton	47	10	0	to	52	10	0
Potassium bichromate	lb.	0	1	10	to	0	2	0
Carbonate, 90%	ton	102	0	0	to	105	0	0
Chloride	ton	Nominal.						
Potassium Chlorate	lb.	0	1	1	to	0	1	2
Meta-bisulphite, 50-52%	ton	250	0	0	to	260	0	0
Nitrate, refined	ton	68	0	0	to	70	0	0
Permanganate	lb.	0	6	0	to	0	6	3
Prussiate, red	lb.	0	6	0	to	0	6	3
Prussiate, yellow	lb.	0	2	2	to	0	2	4
Sulphate, 90%	ton	31	0	0	to	33	0	0
Salammoniac, firsts	cwt.	4	15	0	to	—	—	—
Seconds	cwt.	4	10	0	to	—	—	—
Sodium acetate	ton	57	0	0	to	58	0	0
Arsenate, 45%	ton	55	0	0	to	57	0	0
Bicarbonate	ton	10	10	0	to	11	0	0
Sodium, Bichromate	lb.	0	1	10	to	0	1	11
Bisulphite, 60-62%	ton	38	10	0	to	40	10	0
Chlorate	lb.	0	0	5½	to	0	0	6½
Caustic, 70%	ton	42	10	0	to	43	10	0
Caustic, 76%	ton	44	10	0	to	45	10	0
Hydrosulphite, powder, 85%	lb.	0	3	3	to	0	3	6
Hyposulphite, commercial	ton	23	10	0	to	24	10	0
Nitrite, 96-98%	ton	87	0	0	to	90	0	0
Phosphate, crystal	ton	38	0	0	to	40	0	0
Perborate	lb.	0	2	2	to	0	2	4
Prussiate	lb.	0	1	10	to	0	1	11
Sulphide, crystals	ton	20	0	0	to	21	0	0
Sulphide, solid, 60-62%	ton	38	10	0	to	40	10	0
Sulphite, cryst.	ton	13	0	0	to	13	10	0
Strontium, carbonate	ton	85	0	0	to	90	0	0
Nitrate	ton	85	0	0	to	90	0	0
Sulphate, white	ton	8	10	0	to	10	0	0
Sulphur chloride	ton	42	0	0	to	44	10	0
Sulphur, Flowers	ton	25	0	0	to	27	0	0
Roll	ton	24	0	0	to	26	0	0
Tartar emetic	lb.	0	3	8	to	0	3	10
Tin perchloride, 33%	lb.	0	2	6	to	0	2	7
Perchloride, solid	lb.	0	3	0	to	0	3	3
Protochloride (tin crystals)	lb.	0	2	5	to	0	2	7
Zinc chloride, 102 Tw.	ton	22	0	0	to	23	10	0
Chloride, solid, 96-98%	ton	55	0	0	to	60	0	0
Oxide, 99%	ton	80	0	0	to	82	10	0
Oxide, 94-95%	ton	65	0	0	to	67	10	0
Dust, 90%	ton	70	0	0	to	72	10	0
Sulphate	ton	22	10	0	to	23	10	0
Oxide, Redseal	ton	80	0	0	to	85	0	0

Coal Tar Intermediates, &c.

	per	£	s.	d.	to	£	s.	d.
Alphanaphthol, crude	lb.	0	3	6	to	0	3	9
Alphanaphthol, refined	lb.	0	3	9	to	0	4	0
Alphanaphthylamine	lb.	0	3	6	to	0	3	9
Aniline oil, drums extra	lb.	0	1	5	to	0	1	6
Aniline salts	lb.	0	1	10	to	0	2	0
Anthracene, 85-90%	lb.	—	—	—	to	—	—	—
Benzaldehyde (free of chlorine)	lb.	0	5	6	to	0	6	0
Benzidine, base	lb.	0	12	6	to	0	13	6
Benzidine, sulphate	lb.	0	10	0	to	0	11	0
Benzoic, acid	lb.	0	5	6	to	0	6	0
Benzoate of soda	lb.	0	5	6	to	0	6	0
Benzyl chloride, technical	lb.	0	2	0	to	0	2	3
Betanaphthol benzoate	lb.	1	6	0	to	1	7	6
Betanaphthol	lb.	0	4	9	to	0	5	0
Betanaphthylamine, technical	lb.	0	8	6	to	0	9	0
Croceine Acid, 100% basis	lb.	0	5	0	to	0	6	3
Dichlorobenzol	lb.	0	0	6	to	0	0	7
Diethylaniline	lb.	0	7	9	to	0	8	6
Dinitrobenzol	lb.	0	1	4	to	0	1	6
Dinitrochlorobenzol	lb.	0	1	4	to	0	1	5
Dinitronaphthalene	lb.	0	1	4	to	0	1	6
Dinitrotoluol	lb.	0	1	8	to	0	1	9
Dinitrophenol	lb.	0	3	3	to	0	3	6
Dimethylaniline	lb.	0	4	9	to	0	5	0
Diphenylamine	lb.	0	4	6	to	0	4	9
H-Acid	lb.	0	13	6	to	0	14	0
Metaphenylenediamine	lb.	0	5	9	to	0	6	0
Monochlorobenzol	lb.	0	0	10	to	0	1	0
Metanilic Acid	lb.	0	7	6	to	0	8	6
Monosulphonic Acid (2.7)	lb.	0	7	6	to	0	8	0

	per	£	s.	d.	to	£	s.	d.
Naphthionic acid, crude	lb.	0	5	6	to	0	5	9
Naphthionate of Soda	lb.	0	6	0	to	0	6	6
Naphthylamin-di-sulphonic acid ..	lb.	0	5	6	to	0	6	6
Nitronaphthaline	lb.	0	1	3	to	0	1	4
Nitrotoluol	lb.	0	1	3	to	0	1	6
Orthoamidophenol, base	lb.	0	18	0	to	1	0	0
Orthodichlorbenzol	lb.	0	1	0	to	0	1	2
Orthotoluidine	lb.	0	2	6	to	0	2	9
Orthonitrotoluol	lb.	0	1	8	to	0	1	10
Para-amidophenol, base	lb.	0	15	0	to	0	16	0
Para-amidophenol, hydrochlor	lb.	0	15	6	to	0	16	0
Paradichlorbenzol	lb.	0	0	6	to	0	0	8
Paranitraniline	lb.	Nominal.						
Paranitrophenol	lb.	0	2	3	to	0	2	6
Paranitrotoluol	lb.	0	5	3	to	0	5	6
Paraphenylenediamine, distilled ...	lb.	0	13	6	to	0	14	6
Paratoluidine	lb.	0	7	6	to	0	8	6
Phthalic anhydride	lb.	0	9	0	to	0	10	0
R. Salt, 100% basis	lb.	0	4	0	to	0	4	2
Resorcin, technical	lb.	0	11	6	to	0	12	6
Resorcin, pure	lb.	0	17	6	to	1	0	0
Salol	lb.	0	5	9	to	0	6	0
Shaeffer acid, 100% basis	lb.	0	3	6	to	0	3	0
Sulphanilic acid, crude	lb.	0	1	8	to	0	1	9
Tolidine, base	lb.	0	10	6	to	0	11	6
Tolidine, mixture	lb.	0	3	0	to	0	3	6

Miscellaneous and Paint Materials

	per	£	s.	d.	to	£	s.	d.
Barytes	ton	11	0	0	to	13	0	0
Casein	ton	75	0	0	to	80	0	0
Chalk, precipitated (light)	ton	20	0	0	to	24	0	0
Chalk, precipitated (heavy)	ton	10	0	0	to	12	0	0
China clay (bags extra) (f.o.r. Corn-wall)	ton	1	12	6	to	3	12	6
Coke, blast furnace (S. Wales)	ton	2	13	0	to	2	19	0
Coke, foundry (S. Wales)	ton	3	5	0	to	3	10	0
Fuller's Earth	ton	4	0	0	to	5	0	0
Lead, litharge flake	ton	67	10	0	to	69	10	0
Lead, red	cwt.	3	5	0	to	3	7	6
Lead, white	cwt.	3	15	0	to	3	17	6
Ultramarine	ton	90	0	0	to	110	0	0
Prussian Blue	cwt.	13	0	0	to	14	10	0
Chrome green	cwt.	6	5	0	to	6	10	0
Chrome yellow	cwt.	6	5	0	to	7	0	0
Mineral black	ton	10	10	0	to	12	0	0
Carbon black	lb.	0	1	3	to	0	1	6
Guignet's Green, 30%	lb.	0	1	5	to	0	1	6

Building Materials

	per	£	s.	d.	to	£	s.	d.
Bricks, stock	1000	4	10	0	to	4	12	0
Bricks, blue Staffs.	1000	9	10	0	to	9	11	0
Firebricks, Stourbridge	1000	11	10	0	to	11	12	0
Fireclay, Stourbridge	ton	2	3	0	to	2	5	0
Glass, sheet, 21 oz.	ft.	0	0	8½	to	0	0	8½
Lime, ground blue Liás	ton	2	15	0	to	2	16	0
Lime, grey stone	ton	3	0	0	to	3	3	0
Linseed oil, boiled	gall.	0	12	0	to	0	12	6
Linseed oil, raw	gall.	0	11	3	to	0	11	9
Portland cement	ton	3	19	0	to	4	3	0
Slates, Bangor (First quality) ..	1200	40	0	0	to	41	0	0
Slates, Portmadoc (First quality) ..	1200	21	10	0	to	23	0	0
Tiles	1000	6	15	0	to	7	0	0
Turpentine	gall.	0	17	0	to	0	17	6
Deal, up to 3×8	standard	45	0	0	to	46	0	0
Deal, over 3×8	standard	52	0	0	to	58	0	0

The following prices are furnished by Messrs. Miles, Mole & Co., Ltd., 101, Leadenhall Street, London, E.C.

Metals and Ferro-Alloys

	per	£	s.	d.	to	£	s.	d.
Aluminium, 98-99%	ton	165	0	0	to	166	0	0
Antimony, English	ton	72	0	0	to	75	0	0
Copper, best selected	ton	123	15	0	to	124	10	0
Ferro Chrome, 60%	ton	45	0	0	to	46	0	0
Manganese, 76-80%	ton	30	0	0	to	35	0	0
Silicon, 45-50%	ton	20	0	0	to	25	0	0
Tungsten, 75-80%	lb.	0	3	0	to	0	3	3
Lead Ingot	ton	52	0	0	to	53	0	0
Sheets	ton	67	0	0	to	68	0	0
Nickel, 98-99%	ton	225	0	0	to	230	0	0
Tin	ton	402	0	0	to	403	0	0
Zinc Sheet	ton	83	0	0	to	85	0	0
Spelter	ton	64	0	0	to	65	0	0

Structural Steel

	per	£	s.	d.	to	£	s.	d.
Angles and Tees	ton	25	0	0	to	26	0	0
Flats and rounds	ton	23	0	0	to	27	0	0
Joists	ton	20	0	0	to	25	0	0
Plates	ton	24	0	0	to	26	10	0
Rails, heavy	ton	20	0	0	to	21	0	0
Sheets, 24 Gauge	ton	37	0	0	to	38	0	0
Galvd. Corrd. Sheets	ton	54	0	0	to	55	0	0

Manchester Chemical Market

In their monthly report, Sir S. W. Royse & Co., Ltd., state:—The steady demand experienced during last month has continued throughout February, and many inquiries have had to remain unsatisfied through inadequate supplies of goods. Prices on the whole are again higher, and manufacturers are acting with caution in regard to their commitments. There has been a fair amount of business passing in sulphate of copper both for home and export account, but price is unchanged though still below cost of production. Green copperas continues in good request for export, but trade is restricted owing to difficulty of securing packages. Acetates of lime are scarce. Acetate of soda is dearer, and makers well sold ahead, whilst stocks of acetic acid are small. Lead is higher, litharge has advanced further £3 10s. per ton, and acetates of lead and nitrate of lead have also risen in price. Carbonate of potash is in good request and is firmly held. Montreal potashes are unchanged. There has been a good demand for white powdered arsenic, and any offerings have been quickly taken up. Good business has been done in yellow prussiates of potash and soda, and very little is available for near delivery. Tartaric acid and citric acid are again higher, and the heavy demand continues for both home and export account. Cream of tartar is firmer with the higher prices ruling for raw material. Bichromates of potash and soda are in strong request and stocks nil. Makers of oxalic acid are unable to meet requirements, and re-sale parcels command full figures. Borax and boracic acid continue in demand. Phosphate of soda is again dearer and good business doing for forward delivery. The export inquiry for muriate of ammonia and lump sal ammoniac is brisk. Caustic soda and ammonia alkali have been in heavy request and little offering. Bleaching powder also has been in short supply. Tar products generally maintain their firm position, but business for forward delivery is somewhat restricted owing to makers' disinclination to sell. Benzoles are very firm, prices having recently been advanced fourpence per gallon. A fair amount of business is passing in toluoles. Solvent naphtha is firmer in tone and some good business has been done for July-December at higher values. Creosote has a good inquiry and has advanced again in price. Crude carbolic acid is firm and a moderate business has been done, but the output is not sufficient to meet the demand. Supplies of liquid and crystal carbolic are small. Pitch is a good market and prices are much higher. Makers are not inclined to sell forward, and consequently very little business has been done for next season. Sulphate of ammonia has a big inquiry and a fair business has been done at present values.

Chemical Trade Inquiries

LOCALITY OF FIRM OR AGENT.	MATERIALS.	REF. No.
Canada (British Columbia)	Silica and Talca. (Market sought). Replies to Canadian Government Trade Commissioners' Office, Portland House, 73, Basinghall Street, E.C.2.	...
Belgium (Brussels)	Soap; Candles; Vegetable Oil	270
Portugal	Chemicals; disinfectants	303
Balkan States	Druggists' Sundries; Soap; Glass-ware, &c.	295

Sulphide of Sodium Contract

On Thursday, February 26, in the Commercial Court, King's Bench Division, the case of Luigi Riva de Ferdinando against Simon Smits & Co., Ltd., was mentioned to Mr. Justice Roche. The action was by the plaintiff, a merchant, Milan, Italy, against the defendants, steam ship and shipping agents, of Great Tower Street, City, and elsewhere, in respect of the conversion and detention of 25 tons of sulphide of sodium.

Mr. Schiller, K.C., for plaintiffs, said nothing had been done in the case by defendants.

Mr. Neilson, K.C., for defendants, regretted that his solicitors, Messrs. Cramp, had not yet heard from his clients in Milan as to the price of the sodium at the time. After hearing counsel, his lordship adjourned the matter to March 29, but ordered the defendants to pay interest at the rate of 6 per cent. on the sum awarded and to give security for £1,000.

Company News

UNITED ALKALI.—Further dividend of 10 per cent., making 15 per cent., less tax, for 1919, same as for 1917 and 1918.

UNITED TURKEY RED CO.—341,250 ordinary shares of £1 each are offered to shareholders in the proportion of one new share for every ordinary share now held.

HENRY, BESSEMER & CO.—It has been resolved to increase the capital to £400,000 by the creation of 100,000 additional ordinary £1 shares, to rank in all respects with existing ordinary shares.

SHELTON IRON, STEEL & COAL CO.—The profits for 1919 were £139,088, and £79,620 was brought forward. A further dividend of 5 per cent. is proposed, making $7\frac{1}{2}$ per cent. for the year. £25,000 is added to the reserve, and £80,554 carried forward.

BRITISH ALUMINIUM CO.—The directors have decided to make a distribution out of the reserves of the company by means of the issue of two fully-paid ordinary shares for every three ordinary shares now held, fractions to be disregarded.

UNITED STEEL COMPANIES.—An interim dividend has been declared on the ordinary shares for the half-year to December 31 at the rate of 10 per cent. per annum, less tax, payable March 20, to holders on the register February 23.

SUN FUEL CO.—At a special meeting of shareholders on Monday, resolutions were passed increasing the capital from £250,000 to £500,000. The chairman reported that the directors had purchased the whole of the assets of the neighbouring Atlantic Patent Fuel Co.

KENT PORTLAND CEMENT CO., LTD.—It is understood that 1,200,000 ordinary shares of £1 each are to be issued shortly, 750,000 of which will be offered at par. The remaining 450,000 will constitute part payment of the purchase price of the undertaking acquired—namely, the whole interest in Kent Portland Cement Works, Ltd., at Stone.

LINOLEUM MANUFACTURING.—The net profits for 1919 amount to £99,695. The directors propose payment of 11s. 6d. per share, making 10 per cent. for the year, and a bonus of 5s. per share, both free of tax, payable March 10; to depreciation of investments, £11,284; to benevolent fund, £5,000; carry forward, £19,218.

HADFIELD.—The directors recommend that, in addition to the interim dividend of 6d. per share paid in July last on the ordinary shares, a further dividend be paid on the ordinary shares of 1s. 6d. per share, free of tax. Allowing for the bonus shares distributed since the last balance-sheet, the rate of dividend equals that for each of the three previous years, when it was 30 per cent. on an ordinary capital of £400,000.

SCOTTISH IRON & STEEL CO.—A final dividend of 7 per cent. on the ordinary shares is recommended, making 10 per cent. for the past year. The dividend on the preference shares will be brought up to 8 per cent. The ordinary shares received 6 per cent. for each of the two preceding years, and 4 per cent. for 1916, but for 1915 the dividend on preference shares only was paid.

YORKSHIRE INDIGO, SCARLET & COLOUR DYERS.—After providing for depreciation, &c., the accounts for the year ended December 31 show a net profit of £37,217, and £5,818 was brought in, making £43,034. The directors recommend a dividend and a bonus of 10 per cent., making 20 per cent., less tax, for 1919, against 10 per cent. for 1918, placing £8,240 to reserve fund and carrying forward £6,758.

CANADA CEMENT.—The report for 1919 states that, after providing for interest on bonds, dividends on preferred and common stock, and ordinary reserves, the surplus account has been reduced by \$1,252,786. This is accounted for by the transferring of \$1,011,120 to reserve for fire insurance and by drawing on the surplus to the extent of \$241,666 for depreciation. The company's financial position, however, is strong, current assets, including investments and call loans, amounting to 7.74 times current liabilities.

LEVER BROTHERS.—The report for the year 1919 states that the balance of £2,439,067 standing to credit of profit and loss account, after providing for repairs, renewals and alterations, depreciation and insurance, has been appropriated as follows: Dividend on 5 per cent. first preference, £200,000; on 6 per cent. "A" preference, £345,000; on 6½ per cent. "B" preference, £195,000; on 15 per cent. preferred ordinary, £346,952; on 15 per cent. "A" preferred ordinary, £25,961; on 20 per cent. preferred ordinary, £167,260; on 20 per cent. "B" preferred ordinary, £6,469; on 5 per cent. preferred ordinary, £21,450; co-partnership dividends, £271,299; dividend on ordinary at rate of $17\frac{1}{2}$ per cent. per annum, £355,638; to special reserve, £500,000; balance carried to reserve fund, £4,038.

ABERTHAW & BRISTOL CHANNEL PORTLAND CEMENT.—The profit for the year 1919 was £97,892, and £34,438 was brought in, making £132,330. After paying debenture interest and preference dividend, less tax, the directors make provision of £37,500 for excess profits duty, income tax and contingencies, and recommend a further dividend on the ordinary shares of $12\frac{1}{2}$ per cent., free of tax, making $17\frac{1}{2}$ per cent. for the year, placing to reserve £20,000, and carrying forward £35,608. It is proposed to raise additional capital, and it is intended to offer the new ordinary shares at £1 per share premium to the present ordinary shareholders in the ratio of two shares for every three shares held, and also to give the preference and ordinary shareholders the first call on the preference shares at par.

FORTUNA NITRATE.—A circular to shareholders states that the board has now entered into a conditional agreement with Messrs.

Gibbs & Co., Valparaiso, by which that firm agrees, subject to the approval of proprietors, to take over the whole of the assets and liabilities of the company on terms which, if accepted, would leave £385,000 net cash for distribution among the shareholders. This sum is equivalent to £2. 10s. per share on the 154,000 issued shares, and as Messrs. Gibbs & Co. will bear the whole of the expenses in connection with the liquidation of the company, the £385,000 should be available for prompt distribution among the shareholders after the properties have been transferred and the necessary resolutions for liquidation have been passed. The board recommend the acceptance of the offer.

SANTA MARIA CONSOLIDATED OIL FIELDS.—At a statutory meeting held last week, Mr. J. B. Braithwaite (chairman of the company) referred to the capital position of the company. The report showed that the whole of the shares had been allotted, and that they had paid off all the second debentures, leaving outstanding only \$117,000 of the first debentures, which were being redeemed by a sinking fund of 20 per cent. on every barrel of oil produced, so that if the production was anything like that which they hoped this would be entirely extinguished within the next two years. The preliminary expenses were estimated at £5,000, and were well inside that amount, and they had remitted to California £27,403. They had invested nearly £10,000 in Treasury bills, and had a certain sum of cash in the bank. £35,000 was due to come in from calls on March 1, and another £35,000 on June 1.

CORDOBA COPPER.—The report to December 31 last states that in April, 1919, all operations on the company's mines in Spain were suspended. Subsequently an offer was received from a firm in Cordoba to purchase the mines, buildings, machinery, plant, materials, stores and the whole of the company's property in Spain, and eventually the cash price of 1,000,000 pesetas was agreed upon. During the period commencing January 1, 1919, up to the date of the final suspension of operations total income was £24,714. The expenditure charged in the revenue account amounted to £36,316. The credit balance brought forward from the previous year is £453, to which is added £20,000 transferred from reserve account. The balance now at debit of profit and loss account is £126,227. The assets of the company amount to £74,134, and after allowing £361 for sundry creditors, there remains a balance of resources of £73,773.

INTERNATIONAL PAINT & COMPOSITIONS.—At the 12th ordinary general meeting on February 27, Col. Sir Herbert Jekyll, K.C.M.G. (chairman of the company), said that after writing off bad debts the profit of the company in 1919 was £63,655, as compared with £83,232 in 1918. Income tax and depreciation accounted for £10,377, reducing the amount at their disposal to £53,277, as compared with £73,454 in 1918, but the amount brought forward was again much larger, being £42,786, against £26,332. They therefore had £96,064, as compared with £99,786—a difference of less than £4,000. It was proposed to make provision for excess profits duty by setting aside £40,000, and to pay a final dividend at the rate of 3 per cent. on the preference shares, making the full amount of 6 per cent. for the year, and a final dividend at the rate of 7 per cent. on the ordinary shares, making 10 per cent. for the year—the same as in 1918. It was also proposed to add £10,000 to the stocks contingency fund which was set up last year.

BORAX CONSOLIDATED.—The balance-sheet for the past year shows a profit of £442,023. The requirements for the debenture interest, the interim dividends on the preference shares and on the preferred ordinary shares amount to £127,850, leaving, with the amount brought forward, £419,544. The sum of £40,000 has been placed to buildings, plant, &c.; depreciation reserve account, the annual premium of £5,825 to the credit of the debenture stock redemption sinking fund, and £2,872 to the investment reserve, leaving a balance of £370,848, of which the final dividends on the preference shares and on the preferred ordinary shares, together with the interim dividend on the deferred ordinary shares, absorb £97,500. From the balance the directors propose to pay a final dividend of 2s. per share on the deferred ordinary shares, making 15 per cent. for the year, to place to general reserve £25,000, to income tax reserve £25,000, to pensions and grants fund £5,000, carrying forward £103,348.

UNION COLD STORAGE CO.—It is proposed to increase the capital of the company by £2,700,000, divided into 700,000 further 10 per cent. cumulative "A" preference shares ranking *pavi passu* with the existing 10 per cent. cumulative "A" preference shares, and 2,000,000 7 per cent. cumulative preference shares of £1 each, the directors having satisfied themselves that it is essential to the efficient working of the undertaking that the company should be in a position to control a large amount of refrigerated tonnage. They are therefore making arrangements for the acquisition of a fleet of 15 refrigerated steamers, with a total deadweight capacity exceeding 120,000 tons, more than one-half of which is of very recent construction. The proceeds of the proposed issue will be utilised for the purpose of completing the purchase. The steamers will be acquired subject to first charges amounting to a sum not exceeding £1,500,000, which will be deductible from the total purchase price of £4,342,780. Considerable extensions of the company's stores in Liverpool and Glasgow are taking place and large sums have been required to pay for these extensions over and above the sum of £260,000 advanced by the Food Controller for this purpose.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

London Gazette

Meeting of Creditors

THE NEW CHEMICAL CO., LTD.—The Union Chemical Works, Rusholme, Manchester. First meeting: Creditors, 3 p.m.; Contributories, 3.30 p.m., March 9. Official Receiver's Offices, Byrom Street, Manchester.

Partnership Dissolved

The business of chemists and druggists, carried on at High Street and Bridge Street, Boston, Lincolnshire, by Benjamin John Kent and John Thomas Manton and John Culy Harvey, the executors of the will of Albert Grimble, deceased, under the name of "Grimble & Kent," has been sold to Mr. Arthur Day, of Boston, chemist, who is carrying on the business under the style of "Grimble & Kent." Benjamin John Kent, John Thomas Manton and John Culy Harvey will not be liable for any liabilities contracted in respect of the business after January 12, 1920.

Liquidators' Notices

THE C.V.O. CHEMICAL WORKS, LTD.—A General Meeting of members will be held at 15, Queen Street, E.C. 4, on March 29, at 2.30 p.m. Harry J. Barclay, Liquidator.

ANTHRADUFF SMOKELESS FUEL CO., LTD.—A meeting of creditors will be held at the office of W. L. Jackson & Hesketh, 51, North John Street, Liverpool, on Thursday, March 11, at 11 a.m. W. L. Jackson, Liquidator, 51, North John Street, Liverpool.

Company Winding Up Voluntarily

OXYGEN, LTD.—Liquidator, Frank Leeds, Elverton Street, Westminster.

Mortgages and Charges

[NOTE.—The Companies Consolidation Act, of 1908, provides that every Mortgage or Charge, as described therein, created after July 1, 1908, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges which would, if created after July 1, 1908, require registration. The following Mortgages and Charges have been so registered. In each case the total debt, as specified, in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced since such date.]

GLOUCESTER ICE & COLD STORAGE CO., LTD.—Registered February 19, £500 debentures, balance of £2,000; general charge. *£750. December 31, 1918.

INESON, GIBBS OIL & CHEMICAL CO., LTD., BIRMINGHAM.—Registered February 19, £250 debentures to Hall & Lane, Darwin Works, Birmingham; general charge, also fixed and loose plant and machinery at Marshal Works, Selly Park, and goodwill, trade marks and benefit of all contracts. *Nil. October 4, 1919.

KLENSIT SOAP CO., LTD., ASHTON-UNDER-LYNE.—Registered February 19, £500 mortgage to W. E. Turner, Denton, engineer; charged on land and premises at Ashton-under-Lyne.

LONDON PHARMACEUTICAL REFINERS, LTD.—Registered February 2, £250 debentures to Produce Brokers Co., Ltd., 24, St. Mary Axe, E.C.; general charge. *£500. January 14, 1919.

Satisfaction

OIL REFINERS, LTD., LONDON, E.C.—Satisfaction registered February 23, £8,750, registered September 2, 1912.

New Companies Registered

The following list has been prepared for us by Jordan & Sons, Ltd., company registration agents, 116, and 117, Chancery Lane, London, W.C.:

BIRMINGHAM METALLURGICAL SOCIETY (INCORPORATED), 50, Gravelly Hill North, Birmingham.—To promote science and practice of metallurgy in all its branches. Every member to contribute a sum not exceeding £1, if necessary. Directors: J. H. Stansbie, The Rowans, Gravelly Hill, Birmingham; J. Turner, The University, Birmingham; J. E. Lester, 44, Sandwell, Handsworth; and nineteen others.

GERMICIDES, LTD., 18, Colquith Street, Liverpool.—Merchants and manufacturers of disinfectants and germicides. Nominal capital, £2,000 in 2,000 shares of £1 each. Directors: Maria E. Mason, 25, Easton Road, New Ferry, Cheshire; B. H. Anderton, 11, Meadow Street, New Brighton; W. F. Williams, Fern Lea, Rock Lane West, Rock Ferry, Cheshire. Qualification of Directors, 1 share. Remuneration of Directors to be voted by company.

GOUGH'S ICE & COLD STORAGE, LTD., 6, Portland Street, Southampton.—Ice manufacturers and cold storage proprietors and managers. Nominal Capital, £60,000 in 60,000 shares of £1 each. Minimum subscription, £500. Directors: H. G. Gough, Halloeen, Southampton (chairman); F. Woolley, West End, Southampton; C. C. Dominey, 17, Portland Terrace, Southampton. Qualification of Directors, £500.

LANGHAM BROTHERS, LTD.—Chemical manufacturers and dealers. Nominal Capital, £12,500 in 10,000 preference shares of £1 and 50,000 ordinary shares of 1s. each. Directors: A. Langham, 1, King's Court, King's Gardens, Hove; C. A. Langham, 1, King's Court, King's Gardens, Hove; W. L. Langham, 1, King's Court, King's Gardens, Hove. Qualification of Directors, 1 share.

NUT OILS, LTD.—Planters and Dealers in Palm Oil and other Vegetable Oils, Copra, Rubber, &c. Nominal Capital, £250,000 in 245,000 10 per cent. cumulative participating preference shares of £1 each, and 100,000 deferred shares of 1s. each. Directors to be appointed by subscribers. Qualification of Directors, £200. Remuneration of Directors, £100 each; Chairman, £150. Directors: W. Coombs, 5, New Park Villas, Kingsley Road, South Harrow; G. V. Stevens, 4A, Baron's Court Road, West Kensington.

SHERBRO PALM OIL CO., LTD., Balfour House, Finsbury Pavement, E.C.—Oil producers and extractors. Nominal Capital, £150,000 in 150,000 shares of £1 each. Minimum Subscription, 7 shares. Directors: Rt. Hon. Sir H. S. Samuel, M.P., The Crossways, Sunningdale, Berks.; Colonel Sir A. C. F. Fitz-George, K.C.V.O., C.B., 6, Queen Street, Mayfair; V. G. Graae, Orleans House, Sefton Park, Liverpool; R. A. Cowtan, Welby Croft, Chapel-en-le-Frith; R. F. Eden, The White House, Coombe Warren, Kingston Hill, Surrey. Qualification of Directors, £300. Remuneration of Directors, £250 each; Chairman, £400.

SINGLE ROSE CLAY CO., LTD., Masonic Buildings, St. Austell, Cornwall.—Manufacturers of china clay, china stone, &c. Nominal Capital: £20,000 in 20,000 shares of £1 each. Directors: E. J. Hancock "Tregarne," St. Austell, Cornwall; D. Phillips, "Trewoon," St. Austell, Cornwall; A. H. Richards, "Stenalees," St. Austell, Cornwall; and three others. Qualification of Directors, £200. Remuneration of Directors, £1. 1s. each meeting attended.

WEBB'S CRYSTAL GLASS CO., LTD., 6, Austin Friars, E.C. 2.—Glass manufacturers. Nominal Capital: £750,000 in 700,000 shares of £1 each and 1,000,000 shares of 1s. each. Minimum Subscription, £7. Directors: C. C. Hatry, 36, Upper Brook Street, W.; S. N. Jenkinson, Norton Park, Edinburgh; H. W. Johnston, 266, St. James' Court, S.W.; C. Jackson, Dennis Hall, Stourbridge; T. B. Kitson, 72, Albion Street, Leeds; F. L. Payne, 134, Bedford Court Mansions, W.C.; Sir F. W. Towle, C.B.E., 3, Clarence Terrace, N.W. 1. Qualification of Directors, £500. Remuneration of Directors, £300 each; Chairman, £400.

Benn Brothers Journals

Some Features of the Current Issues

AERONAUTICS.

"The Cairo-Cape Flights"; "The New Avro"; "Characteristics of Design Affecting Production, Operations and Maintenance of Aircraft," by Major Percy Bishop.

THE CABINET MAKER.

"Upholstering in Morocco and Imitation Leather"; "Silvered Bevelled Glass Supplies: Present Position"; "The Furnishing of Aeroplane Coupes."

THE ELECTRICIAN.

Special Textile Issue, dealing with recent advances in the employment of electrical apparatus in the textile industry. "Present Position of the Lancashire Cotton Industry," by Frank Nasmith; "Principles of Manufacturing Textile Goods from an Engineering Point of View," by W. Myers and W. A. Hanton; and "Textile Mill Equipment: Its Advances and Systems," by C. S. Ickringill.

THE FRUIT-GROWER.

"Unification of Organisation—A Great Centrifugal Movement of the Day"; "White Rot Disease of Onions"; National Fruit-Growers' Federation.

THE GAS WORLD.

The Gas World contains a special monthly section treating of the by-product coking industry; and detailed analysis of annual accounts of 18 important gas undertakings.

HARDWARE TRADE JOURNAL.

"Foreign Markets for Dairy Machinery"; Special Metal Market Charts; "Hints on the Erection of Bearings and Shafting."

WAYS AND MEANS.

"America and the Economic Crisis," by Sir George Paish; "Linen and the Clothing Problem," by Alfred S. Moore; "The Menace of the Press," by the Editor; "Ca'Canny," by C. E. Hughes; "The Situation in Hungary," by Alban Parker.

